EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-71

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-14-001	11/01/2013 To 10/31/2016	Comment Tracker Database
	Base Option Period Number 2	

Contractor: ICF INCORPORATED, L.L.C.

Specify Section and paragraph of Contract SOW: C. Risk Assessment Data Bases and Computer Tools

Purpose:
- ☒ Work Assignment
- ☐ Work Assignment Amendment
- ☐ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 11/01/2015 To 10/31/2016

Comments:

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (*Max 2*) ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 11/01/2013 To 10/31/2016 — Cost/Fee: — LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: — Cost/Fee: — LOE:

Cumulative Approved: — Cost/Fee: — LOE:

Work Assignment Manager Name: Susan Rieth (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8582 FAX Number:
Project Officer Name: Melissa Revely-Wilson (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8523 FAX Number: 703-347-8696
Other Agency Official Name: (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Adam Meier (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2852 FAX Number: 513-487-2107

PERFORMANCE WORK STATEMENT
CONTRACT NO. EP-C-14-001
WA 2-71

TITLE: Comment Tracker Database

Principal Section & Paragraph of SOW: ***C. Risk Assessment Data Bases and Computer Tools***

PERIOD OF PERFORMANCE: November 1, 2015 – October 31, 2016

I. PURPOSE

The purpose of the work assignment is to provide services to the U.S. Environmental Protection Agency's (EPA) National Center for Environmental Assessment (NCEA), Office of Research and Development (ORD), specifically to provide software tools and templates to support management of comments on draft Integrated Risk Information System (IRIS) health assessments received at all stages of assessment development. The software tools will assist the IRIS Program in organizing, searching, sorting, and developing responses to comments.

II. BACKGROUND

EPA's IRIS Program is a human health assessment program that evaluates quantitative and qualitative information on health effects that may result from exposure to environmental contaminants. Further details are provided in performance work statements for WA 1-7 and 1-8, and at http://www.epa.gov/iris/.

Each IRIS health assessment is submitted for comment at a number of stages in assessment development, including agency and interagency review, public comment, and external peer review (currently through the Chemical Assessment Advisory Committee of EPA's Science Advisory Board), resulting in numerous comments on each draft assessment.

Given the numerous review comments received for IRIS assessments, an information management tool is needed to support management of comments. The IRIS Program also needs the ability to examine and compare comments and responses across chemicals to improve consistency, eliminate duplication of effort, and identify recurring issues. The proposed solution is a Comment Tracker database that will serve as an information management tool to facilitate the capture, review, categorization, organization, and response to comments received during assessment development. It will also allow analysis of comments within and across assessments.

A Comment Tracker database has been developed within NCEA using Microsoft Access. This prototype database provides many of the database features needed to manage comments, although some of these features are not currently functioning.

Some performance objectives for the database system include:

- Ease of use and short learning curve.
- Facilitates both responses to individual comments, as well as allows grouping similar comments (within an assessment) and writing a single response for the grouped comment.

- Accessible by numerous EPA staff and contractors (preferably simultaneously). Ideally, the database system allows multiple users to work on a single assessment's comments simultaneously.
- Organizes comments and responses by assessment and allows reorganization by EPA staff.
- Allows comparison of comments and responses to them across different assessments.
- Allows control by the EPA Assessment Manager of access and revisions (for each assessment separately), including field level control and ability to lock input to prevent accidental changes to field data.
- Allows flagging of major issues with a short list of tags (scientific, science-policy, etc. – TBD).
- Database should have download/off-line capacity to enable real-time searches during meetings without internet access.
- Database for each chemical can be finalized and archived when the assessment is posted.
- Reports (compatible with MS/Word) can be made for one or several assessments. Report format/content can be customized to meet different needs.

Some significant decisions about the database system include:

- Software platform: EPA currently has a prototype in MS/Access
- Method of comparing and querying databases for different assessments: the prototype uses a front-end (also in MS/Access) that permits querying comments across chemicals.

Work on the Comment Tracker database was begun by ICF in June 2015. EPA evaluated three options offered by ICF for managing assessment comments: (1) Access-based Comment Tracker (a tool initially developed by NCEA), (2) ICF's CommentWorks®, or (3) a hybrid of (1) and (2). On August 21, 2015, EPA directed ICF to move forward with option (1), further development of Comment Tracker.

EPA anticipates that the work will be conducted in phases, consistent with the memorandum from Josh Cleland, Will Baird, and Audrey Turley, ICF International, to Susan Rieth, Lou D'Amico, and Chris Brinkerhoff, EPA, dated July 24, 2015. The target date for a working prototype database is the end of October 2015.

EPA staff experience with the prototype database will inform subsequent discussions with the contractor and technical direction regarding improvements to database features and performance. Comment Tracker development will continue during the period of performance until EPA is satisfied that essential performance objectives are met.

III. SCOPE OF WORK: TASKS AND DELIVERABLES

Task 1. The contractor shall establish communication, submit a work plan, and arrange for routine updates for the EPA Contracting Officer's Representative (COR).

The contractor shall schedule an initial conference call **within 1 week** after the receipt of the work assignment. The call shall include the COR and relevant members of the ICF team. The contractor shall prepare a Work Plan and cost estimate. The Work Plan should describe, in brief, a phased approach for conducting this work consistent with EPA's requested schedule, and methods and procedures that will be used to insure that the database performs correctly (e.g., code review, inspection, and testing). This work assignment does not require a QAPP. This work assignment does not involve use of existing data or collection of new data.

Task 1. Tool Development Activities

EPA anticipates that most of the work on development of a prototype database, consistent with the performance objectives outlined above, will be completed during the previous period of this contract (i.e., by October 31, 2015). Any remaining work on initial development of the Comment Tracker prototype shall be completed

under Task 1 of this PWS. Tool development activities will include those outlined in the July 24, 2015 memorandum from ICF (for the months of July and August) but not completed during the base period of performance.

Deliverables and due dates:

Deliverable: Completion of database prototype
Due: as soon as possible after October 31, 2015

Task 2. Revisions to Comment Tracker

Based on experience working with the prototype database, EPA anticipates that some modifications of the prototype will be necessary to make Comment Tracker an efficient and user friendly tool for NCEA staff to use. It is expected that identification of specific revisions will be accomplished though discussion between EPA and the contractor. Requests for revisions to the prototype database will be provided to the contractor through technical direction.

Deliverables and due dates:

Deliverable: Revised database
Due: To be specified in written technical direction after consultation with the contractor.

Task 3. Other Potential Activities

Other future activities will include some of those outlined in Section 2.3 of the July 24, 2015 memorandum. These activities are likely to include: (1) generation of new report formats, (2) adding functions to support searching Comment Tracker across assessments, (3) developing a user guide, and (4) creating a web interface. EPA will provide further direction on which of these activities to undertake and the priority for enhancements of Comment Tracker through technical direction based on initial experiences with using the prototype database and discussions with the contractor.

Deliverables and due dates:

Deliverable: Enhancements to Comment Tracker
Due: To be specified in written technical direction after consultation with the contractor.

Task 4. Populate Comment Tracker

The contractor may be asked to populate the Comment Tracker database with comments obtained during one or more steps of the IRIS assessment review process (i.e., Agency review, interagency review, public comment, or peer review). For purposes of cost estimation, the contractor shall assume that four sets of comments shall be added to Comment Tracker, and that a modest number of comments are received for a given chemical assessment. It is likely that the addition of comments to Comment Tracker will be for different chemicals.

Deliverables and due dates:

Deliverable: Addition of comments to Comment Tracker for individual IRIS health assessments.
Due: To be specified in written technical direction after consultation with the contractor.

V. SCHEDULE OF DELIVERABLES

This schedule and the deliverable dates specified under each Task above may be changed using written Technical Direction.

Task	**Schedule** (all days are elapsed calendar days unless otherwise stated)
Task 1	Database prototype: October 31

Task 2	Revised database: To be specified in written technical direction after consultation with the contractor.
Task 3	Other potential activities: To be specified in written technical direction after consultation with the contractor.
Task 4	Populate Comment Tracker: To be specified in written technical direction after consultation with the contractor.

The contractor should consult with EPA if the proposed schedule of deliverables cannot be achieved, and work with EPA to identify what can be accomplished to meet EPA's need for a working Comment Tracker database.

VI. NOTICE REGARDING GUIDANCE PROVIDED UNDER THIS PROJECT

Guidance is strictly limited to technical and analytical support. The contractor shall not engage in activities of an inherently governmental nature such as the following:

(1) Formulation of Agency policy
(2) Selection of Agency priorities
(3) Development of Agency regulations

Should the contractor receive any instruction from an EPA staff person that the contractor ascertains to fall into any of these categories or goes beyond the scope of the contract or work assignment, the contractor shall immediately contact the PO or WAM.

The contractor shall also ensure that work under this work assignment does not contain any apparent or real personal or organizational conflict of interest. The contractor shall certify that none exist at the time the proposal is submitted to EPA. The Contractor shall be responsible for obtaining a conflict of interest certification for any subcontractor services.

VII. SPECIAL CONDITIONS AND ASSUMPTIONS

The contractor shall provide regular updates on progress and any issues that need to be resolved to the WAM by telephone or by email. Any technical directions made during informal discussions shall be issued promptly by the EPA WAM in writing (to include email).

VIII. EPA CONTACTS

EPA Work Assignment Manager (WAM)

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EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-71

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-14-001	11/01/2013 To 10/31/2016	Comment Tracker Database
	Base Option Period Number 2	

Contractor: ICF INCORPORATED, L.L.C.

Specify Section and paragraph of Contract SOW: C. Risk Assessment Data Bases and Computer Tools

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [X] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 11/01/2015 To 10/31/2016

Comments:

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1										
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Authorized Work Assignment Ceiling

	Cost/Fee:	LOE:
Contract Period: 11/01/2013 To 10/31/2016	$0.00	0
This Action:	$79,275.00	1,000
Total:	$79,275.00	1,000

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated: 11/19/2015	$79,275.00	1,000
Cumulative Approved:	$79,275.00	1,000

Work Assignment Manager Name: Susan Rieth (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8582 FAX Number:
Project Officer Name: Melissa Revely-Wilson (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-0207 FAX Number:
Other Agency Official Name: (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Adam Meier (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2852 FAX Number: 513-487-2107

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-75

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-14-001	11/01/2013 To 10/31/2016	Human exposure models
	Base Option Period Number 2	

Contractor: ICF INCORPORATED, L.L.C.

Specify Section and paragraph of Contract SOW: A. 5, B, F. G & H

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 11/10/2015 To 10/31/2016

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (*Max 2*) ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
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Authorized Work Assignment Ceiling

Contract Period: 11/01/2013 To 10/31/2016 — Cost/Fee: — LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: — Cost/Fee: — LOE:

Cumulative Approved: — Cost/Fee: — LOE:

Work Assignment Manager Name: Daniel Vallero	Branch/Mail Code:
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(Signature) (Date)	Phone Number: 703-347-8523
	FAX Number: 703-347-8696
Other Agency Official Name	Branch/Mail Code:
(Signature) (Date)	Phone Number:
	FAX Number:
Contracting Official Name: Adam Meier	Branch/Mail Code:
(Signature) (Date)	Phone Number: 513-487-2852
	FAX Number: 513-487-2107

PERFORMANCE WORK STATEMENT
CONTRACT NO. EP-C-14-001
WA – 2-75

TITLE: Identification and adaptation of human exposure models to improve exposure factors in life cycle analysis applied to products and articles

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PERIOD OF PERFORMANCE: WA Approval Date – 10/31/2016

Specify Section & Paragraph SOW: (select all that apply)
A. Assessment Issues and Documents
5. Integrated Science Assessments
B. Risk Assessment Methods Research and Development
F. Information Management
G. Literature Search
H. Physiologically-Based Pharmacokinetic (PBPK) Model Technical Support

I. PURPOSE

The purpose of this Work Assignment (WA) is to provide services to the U.S. Environmental Protection Agency's (hereinafter EPA or Agency) Human Exposure and Atmospheric Sciences Division of the National Exposure Research Laboratory, Office of Research and Development (ORD).

II. BACKGROUND

The EPA's Chemical Safety for Sustainability (CSS) research program has been developing new ways to prioritize the chemicals that are ingredients of products and articles. This prioritization has addressed both the toxicity potential (i.e. ToxCast) and exposure potential (i.e. ExpoCast). Together, these will be the basis for improved methods and approaches for risk prioritization of chemicals as early as possible in the development process, with the objective of identifying chemicals before they reach the marketplace or before they are ingredients in products wherein the use would lead to unacceptable exposures. Within modern society, exposure to a wide range of chemicals through our daily habits and routines is ubiquitous and largely unavoidable. The initial focus to estimate exposure to chemicals in products used in microenvironments (μE) necessitates a "systems" model to delineate data needs arising from numerous knowledge bases to integrate product formulations, purchasing and use activities, and human activities.

Evaluating chemical safety and sustainability over the life cycle of chemicals requires drawing upon the various data streams and impact assessment tools from the life cycle assessment (LCA) field, along with improved exposure models that rapidly and reliably characterize exposures and human health impacts of chemicals from direct and indirect exposure pathways, which vary across their full life cycle. LCA has proven to be a valuable tool for systematically comparing processes and products; however, exposure assessment has almost exclusively been devoted to far-field scenarios. Integration of human exposure modeling of near-field scenarios into LCA will require bridging the scientific and technical gaps that currently prevent the harmonious use of the best available methods and tools from both fields. A critical linkage is the development of a modeling system that makes use of existing stochastic and mechanistic human exposure models and will readily link to inputs and tools from the front-end life cycle inventory (LCI) and LCA modules; especially by enhancing the exposure factor in the calculation of the human health characterization factor.

The human exposure modeling elements of the overall research project will include the evaluation of existing model systems and appropriate adaptation of models to life cycle stages. The following life cycle stages are of particular interest in this effort, in order of priority:

- Residential/general population product use (near field exposure pathways)
- Occupational (professional) product use (near-field exposure pathways)
- Product end-of-life (recycling, reuse, disposal for near- and far-field exposure pathways)
- Product manufacturing (far-field and near-field exposure pathways)
- Chemical manufacturing (far-field and near-field exposure pathways)

Initial research efforts will focus on adapting and integrating near-field residential and general population exposure models into the life cycle framework, and extension of the models to near-field occupational (professional) product use. Evaluation, selection, and adaptation of end-of-life and occupational manufacturing models and modeling approaches is envisioned as a longer-term goal of this effort. Potential collaborations with NIOSH or other relevant organizations for occupational manufacturing exposure modeling will be explored.

This research supports work under the life cycle-human exposure modeling project (LC-HEM). Specifically it supports the creation of the Human Exposure Model (HEM). A description of the HEM is provided in attachment 1(The Human Exposure Model (HEM) CSS Life Cycle Assessment and Human Exposure Modeling project Defining Functional Goals, Workflows, and Architecture October 14, 2015 Draft). The expectation of this tool is the development of more reliable and better estimates of human health impacts expressed in terms of traditional dose and risk findings and characterization factors (CFs) through enhancement of exposure metrics within the CF calculation. For residential (and professional) product use, the research builds directly upon recent advances in exposure-based chemical prioritization, ExpoCast, and SHEDS-HT (Stochastic Human Exposure and Dose Simulation, High-Throughput model), and will complement the CSS Rapid Exposure & Dosimetry Project. In particular, the research will leverage the knowledge gained through application of SHEDS-HT to provide higher-throughput estimates of exposure to chemicals in consumer products and articles, based on product chemical function and composition databases, e.g., Chemical and Product Category (CPCat) and Consumer Product Chemical Profiles database (CPCPdb), respectively. The LCI and LCA approaches will benefit from evaluation tools for sustainable manufacturing of chemicals (e.g., GREENSCOPE) for providing specific information at a sub-process level for LCI generation. In addition, the tool will need to address other approaches for assessing alternative formulations that include consideration of exposure, risk, and impacts on risks from aggregate exposures to a chemical.

Over the FY15-16 time period, the HEM model will be created for application in a life cycle inventory and assessment framework and for traditional exposure and risk findings. HEM will be constructed using improved time-location-activity diary and dietary algorithms and modification of SHEDS-HT modules to support additional pertinent near- and far-field exposure scenarios. In the longer time frame, near-field model results will be combined with information from other models for chemical/product manufacturing, use and disposal and fate and transport. Moreover, the human exposure modeling system will be developed to be flexible enough to accommodate the LCI and other LCA inputs, scenarios or processes. The project will also include various means of incorporating exposure information into characterization factors, e.g. adaptation of intake fractions, especially the product intake fraction (PiF), which can be combined with toxicity factors, e.g. ToxCast activity concentrations.

Scenario development is an important part of this effort and will be used to define and guide human exposure modeling system development. The system will represent far-field and near-field exposure scenarios. Existing models, especially USEtox, show promise in informing far-field aspects of each life cycle, including the end-of-life outputs. Likewise, SHEDS-HT may be a starting point for near-field models, beginning with residential

product and article use and possible adaptation to professional product use. However, other models may be considered and adapted as appropriate. The project will also explore the use of screening approaches to determine if far-field, occupational, and end-of-life exposures merit a detailed assessment.

In addition, to simulate different exposure and dose scenarios for chemicals across life-cycle stages, it is important also to consider the differences in the physiologic and pharmacokinetic factors for effected individuals at various life-stages. PBPK models have the capability to incorporate these physiological (e.g., body weight, fat percentage) and pharmacokinetic (e.g., metabolism rate, enzyme levels) variations in a study population. We plan to link probabilistic models of inter-individual variation in exposure and dosimetry using a modular exposure-to-dose approach to investigate the internal doses that occur in the various populations exposed throughout the life-cycle of a product. At this time it remains unknown whether this can be accomplished through a simple adaptation of an existing algorithm or will require development of a de novo approach. For modeling these linkages and doses, initially we will consider selecting chemicals such as flame retardants or other SVOCs in building materials in a relevant PBPK model for the human exposure modeling system. In particular, we may utilize the GastroPlus software tool and other PBPK related information from internal and external EPA collaborators during the development of the task-specific PBPK models. The goal of the PBPK modeling is to provide more rapid dose estimates across wider ranges of chemical space using widely available chemical and physiological parameters for relevant populations, life cycle stages, and time frames.

An overall goal of the research supported in part by this work assignment is a model that generates exposure estimates of interest to various stakeholders. The model sensitivities and uncertainties will be assessed for each integrated modeling framework. Finally, several forms of model evaluation activities will be performed to ascertain the confidence in the model predictions. Individual modules of the modeling system can be evaluated independently (e.g., scenario definitions, emissions, concentrations, exposures), and overall model performance of the system can be evaluated methodically using biomonitoring data that is currently available (e.g., NHANES) or yet to be collected (e.g., by NIEHS/EPA Sister's Study Pilot project, Duke University's anticipated NIEHS-sponsored SVOC exposure and obesogens project). The biomarker data from such sources will be analyzed either directly or interpreted via reverse toxicokinetics (RTK) semi-empirical modeling methods.

This research project integrates emerging scientific information and tools from the LCA and chemical exposure and dose modeling areas. In particular, the integrated LCA/Exposure Modeling framework will provide the capability to rapidly assess environmental and human exposures to many chemicals and products over the life cycle of chemicals, to support the sustainability goals of CSS and other ORD integrated trans-disciplinary research areas. After environmental and human exposure assessments, the user will be able to identify the main life cycle stages that are influencing the evaluation results. The exposure and dose modeling tools will allow more rapid, flexible and reliable prediction of human exposures and doses for chemicals of interest to CSS within an enhanced LCA framework. The HEM model will be modular, which will facilitate further integration with ecological and hazard databases by separating inputs, model algorithms, and outputs of variability, sensitivity and uncertainty associated with the predictions.

III. STATEMENT OF WORK

Task 1: Work Plan, Staffing Plan, and Quality Assurance Project Plan (QAPP)

Within 5 work days of start date of this WA, the Contractor shall schedule a conference call (not to exceed 2 hours) with the WA contracting officer representative (WACOR) and appropriate Contractor staff to clarify outstanding questions and confirm the schedule and specific tasks.
The Contractor shall submit work and staffing plans that reflect the level of expertise and skills needed to accomplish this WA.

The Contractor shall develop a revised Quality Assurance Project Plan (QAPP) for approval by the WACOR and Quality Assurance Manager by modifying the existing QAPPs, "Quality Assurance Project Plan: Interface for Uploading Exposure Data into ExpoCastDB" (Final Version 2.0, Dec. 2013, EPA Contract: EP-W-12-010, Work Assignment 1-14) and "Quality Assurance Project Plan: Development of Rank-ordered Internalized Dose Metric for High Throughput Exposure Estimation of Chemicals to Support Robust Methods for Route- and Chemical-specific Dose Forward Predictions" (Final Revision 0, Oct. 2014, EPA Contract: EP-W-12-010, Work Assignment 2-30) previously prepared by the Contractor and approved by EPA. The Contractor must address in the QAPP how they are going to consider the use of secondary data to carry out this task. Secondary data are defined as environmental or health data that were developed for a different purpose. This includes data used from citations found in the literature. See these documents for reference in developing the revised version of the QAPP: Chapter 3 Projects Using Existing Data in the EPA Guidance for QAPPs (EPA QA/G-5; http://www.epa.gov/quality/qs-docs/g5-final.pdf) and Appendix A. *Quality Assurance Instructions for Contractors Citing Secondary Data* (attached).

Deliverable: The QAPP shall be submitted simultaneously with the Work Plan and Staffing Plan for approval. The Contractor shall not perform any work on subsequent tasks under this WA until the Work/Staffing Plan and QAPP are reviewed and approved.

Task 2: Model Assessment

Based on selection criteria and template provided by the WACOR, the contractor shall review the human exposure modeling literature for occupational exposures chemical synthesis and transport of the chemical, formulation of the chemical in a product and stages of the lifecycle. Particular attention should be paid toward predicting the range of doses likely to occur based on a chemical's physical and chemical properties, structure and the nature of the product being created.

For this review, the contract shall recommend a select, small group of candidate models. Each selected model's applicability and robustness will be summarized according to platforms/software, parameters, input data needs, and output data.

Deliverable: Model summary spreadsheet and report, pursuant to template provided by WACOR.

Task 3: R package for identifying products containing a chemical and characterizing the weight fraction of the chemical in a product

The contractor shall develop an R package to facilitate access to, and reports on, a number of data sets related to the LC-HEM project. Specific list of types of data to be included will be provided by the WACOR (e.g. product composition, chemical-to-use category linkages, functional use information, etc.) Some data sets will be provided by the WACOR for inclusion in the R package (e.g. REACH categories for chemical uses, CPCat (Dionisio et al. 2015, *Toxicology Reports)*, CPCPdb (Goldsmith et al. 2013, *Food and Chemical Toxicology),* MSDS sheets, and Danish EPA surveys on chemicals in consumer products). Other data sets (e.g. composition of articles (e.g. weight fraction/ingredient list; priority), additional consumer product ingredient lists) will be mined by the contractor from available literature or publicly available data sources (published journal articles, 'gray' literature, professional organizations, retail websites, etc.). Newly mined data sets will be provided to the WACOR along with appropriate documentation of their source. Final R package should accept standard .csv format input files of the data, and should include a function both for output of specific subsets of data (as .csv files and R data sets) based on user selected parameters of interest, and a function for output of summary reports again based on user selected parameters of interest. Final R package should be thoroughly commented within

code, and should include all appropriate and necessary documentation for eventual publishing as a public R package. Data will be stored as an appropriate database format (e.g. MySQL) as directed by the WACOR.

Deliverable: R package with all necessary code and documentation, and .csv files of newly mined data including source information.

Task 4: Consumer product category use parameters

The EPA's SHEDS-HT human exposure model (Isaacs et al. 2014, *ES&T*) currently includes ~250 consumer product categories mapped to exposure scenarios and routes. Each consumer product category is associated with a number of parameters including distribution of mass of the product used, frequency of use, prevalence of use in the population, and duration of direct use. Currently the parameters for approximately half of the consumer product categories are based on assumptions, with the other half derived from published data (field studies, Exposure Factors Handbook, literature, Study of Use of Products and Exposure-Related Behaviors (SUPERB) study, etc.). Complete list of categories and details of assumed parameters vs. data-based parameters are provided in Section E of Supplemental Material in Isaacs et al. 2014. Contractor shall make a best effort to gather additional data from published or other publicly available sources (professional organizations, 'gray' literature, etc.) to fill in for all parameters currently not based on data (noting that data may not be available for all parameters for all product categories). Contractor will provide sources of the data gathered, and their recommendation of the value to be used for relevant parameters. WACOR will provide guidance on which product categories and parameters should receive priority for investigation.

Deliverable: Spreadsheet of recommended values for SHEDS-HT consumer product category parameters currently 'assumed' (i.e. not data-driven), including links to appropriate data/source citations.

Task 5: Identification, collection, and organization of demographic data on exposure relevant characteristics of individuals in exposed populations

Central to implementing the LC-HEM modeling is the availability of distinct profiles of subjects, including data on a number of characteristics:

- demographic information (age, gender, ethnicity, SES)
- housing information (room sizes, air exchange rates, HVAC, outdoor spaces (garden, pool), flooring types)
- personal characteristics (pet owner, geographic region of residence)
- consumer tendencies both in the home (home contains 2 televisions, 4 mattresses, and 2 couches) and otherwise (tendency to buy 'green' personal care products)
- human behaviors.

Note that many of the above characteristics may be probability based and/or linked to other characteristics (e.g. a subject of low SES has a high probability of living in low-income apartment housing and a low probability of living in a mansion; living in FL you have a higher probability of having a pool in your backyard than living in ND). Of particular interest in addition to the raw data are the correlation structures and inter-dependencies of the data. Contractor will perform a data gathering exercise to collect publicly available information (from published journal articles, gray literature, websites, etc.) on above listed characteristics. WACOR will provide guidance on a specific list of characteristics to be investigated (including correlation structures and inter-dependencies), including priority of each.

Deliverable: All data sets (including data on correlation structures or interdependencies) collected by the contractor shall be provided as .csv files, along with appropriate documentation and source citations.

Task 6: Development of R packages for dose calculations, population generation, and residential/workplace environments based on SHEDS-HT and earlier versions of SHEDS

As discussed in Appendix B, HEM will be designed as a series of modules. SHEDS-HT is currently written in a modular format; however, the modules that define the product, the exposed individual, and the exposure conditions are interconnected with the module that determines dose. This task will be to create separate R packages to 1. generate estimates of dose; 2. define the characteristics of the exposed populations, and 3. define the characteristics of the residential/occupational environments. Concurrent with development of these packages will be development of a standardized language and format for modules to define inputs and outputs, facilitating the seamless transfer of information between the packages. As an example of the contents for each package: the dose calculation package shall be constructed to solely contain calculations of dose (and not construction of input files), and will instead rely on inputs from other modules or sources developed by the contractor or provided by the WACOR. Input files may, for example, describe the exposed individual, the location of the exposures, the nature of the chemical, and the source.

Further, the dose calculation package shall be constructed to allow for longitudinal calculation of dose (e.g. characterizing cumulative dose from multiple exposures across days, or from single events which result in exposures with a release over multiple days), and the modeling of combined exposures to more than one chemical. Specifically, the module will output a daily dose:

- for one or more chemicals,
- for each day for periods up to one year, and
- for each individual in a simulated population.

The R packages will be based on the version of SHEDS-HT that is scheduled to be delivered under WA 2-78, thus this task shall not be initiated until completion of the relevant tasks in WA 2-78. The packages should be suitable for future conversion into modules that will operate on a cloud-based system.

Deliverable: R packages with all necessary code and documentation.

IV. ANTICIPATED DELIVERABLES

All products by the Contractor must be of high quality, written in a clear concise style, with a logical organization and presentation. Deliverables shall be provided to EPA in electronic formats compatible with EPA-supported software (likely to be Word, R, and Excel).

V. DELIVERABLES AND SCHEDULE

Task 1. Work Plan, Staffing Plan, and QAPP	Initial Conference Call 5 work days after award of Work Assignment. QAPP provided 20 work days after award
Task 2. Model Assessment	Report and spreadsheet provided 15 work days after approved QAPP
EPA Comments	15 work days after receipt of report and spreadsheet
Completed task	15 work days after receiving EPA comments
Task 3: R Package- product composition	January 8, 2016
EPA Comments	15 work days after receipt of preliminary R package and documentation

Completed task	30 work days after receiving EPA comments
Task 4: Consumer product use category parameters	February 5, 2016
EPA Comments	15 work days after receipt of report and spreadsheet
Completed task	30 work days after receiving EPA comments
Task 5: Exposure relevant characteristics	April 8, 2016
EPA Comments	15 work days after receipt of report and spreadsheet
Completed task	30 work days after receiving EPA comments
Task 6: R packages for various modules of exposure modeling	June 3, 2016
EPA Comments	20 work days after receipt of report and spreadsheet
Completed task	30 work days after receiving EPA comments

VI. MANAGEMENT CONTROLS

1. All deliverables shall be reviewed for conformance to the requirements of this WA before being approved as final.

2. The Contractor shall comply with other applicable requirements for final WA reports stipulated in contract.

VII. NOTICE REGARDING GUIDANCE PROVIDED UNDER THIS PROJECT

Guidance is strictly limited to technical and analytical support. The Contractor shall not engage in activities of an inherent governmental nature such as the following:

(1) Formulation of Agency policy
(2) Selection of Agency priorities
(3) Development of Agency regulations

Should the Contractor receive any instruction from an EPA staff person that the Contractor ascertains to fall into any of these categories or goes beyond the scope of the contract or WA, the Contractor shall immediately contact the Work Assignment Contracting Officer Representative (WACOR), Project Officer (PO), or Contracting Officer (CO).

VIII. SPECIAL CONDITIONS AND ASSUMPTIONS

The Contractor shall hold a conference call with the EPA WACOR at the initiation of the work assignment, and shall provide a bi-weekly update to the WACOR by telephone and monthly written update for the duration of the WA, in addition to the standard reporting requirements of the contract.

IX. EPA CONTACT INFORMATION

Work Assignment Contracting Officer Representative (WACOR): Daniel A. Vallero, PhD, NERL/HEASD, vallero.daniel@epa.gov, 919-541-3306

Alternate WACOR: Peter P. Egeghy, PhD, NERL/HEASD, egeghy.peter@epa.gov, 919-541-4103

Appendix A

Quality Assurance Instructions for Contractors Citing Secondary Data

When citing secondary data:

1) List sources for the references cited for each data set including raw data.

2) Identify the most relevant info or key studies among the references cited and critically evaluate them according to focus, verification, integrity, rigor, utility, and clarity. (See: http://www.epa.gov/grtlakes/quality/training/planning/Handout_SecondaryData_ORD_NCEA_TemplateApril2009.pdf)

Section 515 of the Treasury and General Government Appropriations Act for fiscal year 2001 directed the Office of Management and Budget (OMB) to issue guidelines to all Federal agencies to ensure and maximize the quality, objectivity, utility, and integrity of the information they disseminate. This law and the OMB guidance subsequently issued in 67 FR 8452 (02/22/02) underscore the need for EPA/NCEA to assess the quality and credibility of the secondary research information cited in its assessment documents.

Secondary research information is defined as information that was originally produced for one purpose but is now being recompiled or reassessed for a different purpose. Secondary research information usually originates from such primary sources as journal articles, books, government and industry reports, databases, and models. The set of processes that follows serves as a guide to evaluate the strength of secondary data gathered from these primary sources.

The Contractors must list the sources for the references cited in his/her document chapters or sections. The source list will include but not be limited to the names of any commercially available or local databases searched by computer or by hand, the search terms and search strategy used, and the time period of the search. List any print sources like books or journal articles which provided references. List any sources of raw data.

After fully reporting all of the reference sources, identify the most relevant information or key studies among the references you cite and critically evaluate them. Key studies are those most crucial or pivotal to answer the research questions for the project. The key study may have positive or negative results and may even be all that is currently available on the research topic, but the key study is integral to any discussion of the topic. Sometimes, the key study is not recognizable until all of the literature is gathered and evaluated. Key studies should exhibit at least most of the general attributes defined below:

FOCUS: the work not only addresses the area of inquiry under consideration but also contributes to its understanding;
VERIFY: the work is consistent with accepted knowledge in the field or, if not, the new or varying information is documented within the work; the work fits within the context of the literature and is intellectually honest and authentic;
INTEGRITY: Is the work structurally sound? In a piece of research, is the design or research rationale logical and appropriate?
RIGOR: the work is important, meaningful, and non-trivial relative to the field and exhibits sufficient depth of intellect rather than superficial or simplistic reasoning;
UTILITY: the work is useful and professionally relevant; it makes a contribution to the field in terms of the practitioners' understanding or decision-making on the topic.
CLARITY: Is it written clearly and appropriately for the nature of the study?

The Human Exposure Model (HEM)
CSS Life Cycle Assessment and Human Exposure Modeling project
Defining Functional Goals, Workflows, and Architecture
October 14, 2015 Draft

The LCA-HEM Project

NERL is tasked with the development of a publically available web-based software, Human Exposure Model (HEM) for assessing exposures to chemicals that occur over the lifecycle of a commercial product. The tool will be integrated with the LCA model being created by NRMRL to create the final Life Cycle Analysis- Human Exposure Model (LCA-HEM) software tool.

The components of the LCA-HEM project are defined in terms of two tasks:

a) Develop a framework and database structure that brings together chemical exposure and life cycle modeling; and,
b) Develop a tool for evaluating chemical/product impacts in a life cycle assessment framework to support decision-making through improved risk and sustainability analysis that can be used by programs and regional offices of EPA.

This document presents a preliminary design for the HEM tool. The design will include preliminary descriptions of the components of the model, the specific capabilities of the software, and workflows. The design of the software will build on work performed under the Rapid Exposure Dosimetry (RED) project, existing models of occupational exposures, the USETOX model, and toxicity predictions based on HTS toxicity data from RapidTox or other sources.

Background

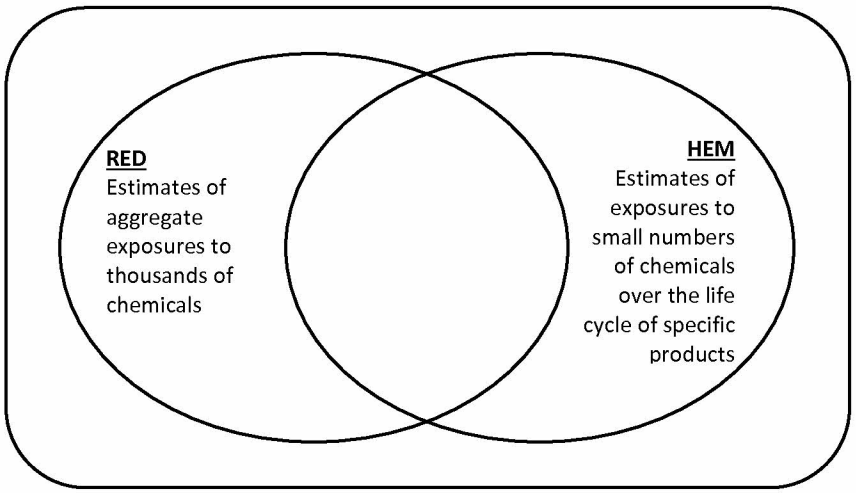
A. Justification for the project

The LCA-HEM model is based upon the following concept. *Chemicals enter into commerce by a decision to incorporate the chemical into a commercial[1] product, or into a process that creates a product, in order to meet a specific requirement of the product.* This project is seeking to build tools that will allow program and regional offices of EPA to assess rapidly the impacts of the decision to us a chemical in a commercial product.

B. The relationship between the HEM and RED projects

The HEM project will work closely with the RED project. Both projects have the requirement to characterize the exposures that occur from the use of commercial product, the figure below. However, the two project use such estimates in different ways.

[1] Commercial product is defined as any product that is available for purchase. The definition includes products that are sold to the general public (consumer products) and products that are sold for use in occupational settings. It does not include bulk chemicals or chemical intermediates.



Unlike SHEDS HT that is being developed under the RED project, the HEM model will not assess thousands of chemicals in one model run. Instead, it will:

1. Assess a single product and a relatively small number of substances that are candidates for multiple formulations of the product
2. Assess the aggregate doses of a chemical from use in multiple products, or
3. Assess the combined exposures to small sets of chemicals that reflect different formulations of a product.

HEM will need SHEDS HT's capacity to access data relevant to a wide range of chemicals and the products that contain them in a rapid and accurate manner but it will not run thousands of chemicals at one time.

Scope of HEM

The goal of HEM will be to make useful exposure estimates for any chemical where the structure can be specified. This will require that the software have the ability to access data on exposure currently being collected and organized by the RED program and when such data are not available to estimate the missing data using conservative assumptions and the structure of the chemical itself.

The determination of the impacts associated with the selection of a chemical is complex. The full LCA-HEM tool will need to assess many aspects of chemicals. This will be performed using a range of tools these include Life Cycle Assessment (LCA), traditional exposure/risk assessments, and exposure/risk assessment based on the use of high throughput screening assay data. LCA requires a range of information on a chemical. The HEM is designed to provide one type of information, the potential for exposure to the chemical.

LCA and risk assessments address exposure in different ways. LCA has focused on making decisions under conditions of minimal information on toxicity and exposure as a result it has addressed exposure in terms of the mass of a chemical released from a specific stage in the lifecycle of a chemical that reaches one or more individuals at any point in time. Risk assessments require more detailed exposure information including the size of the exposed population and variation in doses across the population. The HEM will provide both types of information.

The HEM is intended to facilitate the use of hazard data from novel *in vivo*, *in vitro*, and *in silico* data. Such hazard data define exposures in terms of internal concentrations rather than administered doses (mg/kg/d). In

order to use this information HEM will include PK based models of Adsorption, Distribution, Metabolism, and Excretion (ADME). These models will generate the time courses of the chemicals, or their metabolites, in the circulating plasma and possibly other tissues.

The decision to include the chemical in the production of a commercial product triggers both the manufacture of the chemical and the presence of the chemical in the commercial product. This leads to exposures that occur:

- The manufacture of the chemical;
- Transportation of the chemical to the product manufacturer;
- The manufacture of the product;
- Product users (occupational and general public);
- Bystanders when the product is used;
- End-of-Life exposures; and
- Environmentally mediated exposures.

The HEM will assesses the entire lifecycle of the chemical from its creation to its final release at the end of the lifecycle of the product. The assessment should include findings of risks to human health and sustainability. The HEM model is focused on the chemicals involved in the manufacture of commercial products. LCA analyses have considered the impacts of chemical exposure that indirectly occur during the Life Cycle of a product (e.g., exposures that occur during the production of the electricity required for product manufacture). The HEM will not include an assessment of these impacts. The LCA model may include these impacts. Finally, during this assessment of exposure other types of information (the amount of a chemical used in a product, size of the exposed human population, releases to the environment, etc. are also generated). These and other data are useful in the LCI assessment. As a result, the HEM will also provide such data to the LCA components of the final model.

Users and Workflows

A. Users

Software design begins with the identification of the purpose of the software. Defining the purpose requires identifying who will use the software, why they are using the software, the specific questions that will need to be answered, and the data the user will bring to the assessment. The workflow of a computer program specifies the order that specific tasks are performed, the types of information required by each step, and the information generated. The workflow defines how information is obtained, generated, moved, stored, and made available to the user. When a software program is attempting to meet the needs of multiple goals, multiple workflows may be required.

The workflows for HEM are designed to meet the needs of three types of users. (Note: more users can be added):

- The first type of user is interested in assessing of risks associated with the use of a specific chemical in a specific product (or in all consumer products) over the lifecycle of the product,
- The second user is interested in performing an assessment of the sustainability of the use of a chemical in a product using LCA, and
- The third type of user is interested in performing a comparative assessment of the sustainability two or more candidate chemicals, or candidate formulations, in a product (alternative assessments).

Risk user

The risk user is focused on the assessment of human health risks associated with the chemicals of interest in the multiple populations exposed over the life cycle of a product. The user will need the software to provide:

- Determination of the characteristics of the populations exposed to the chemicals during the manufacture and transportation of the chemical and the lifecycle of the product.
- Screening estimates of aggregate exposures from multiple exposures to the chemical at different points in the manufacture and transportation of the chemical and the product's lifecycle. These are used to determine if the exposures to a population are sufficiently large as to merit a full analysis (exceeded a *de minimis* cut off).
- Determinations of the distributions doses across individuals in each of the exposed populations.
    - Where the populations exposed include multiple age groups, separate estimates will be made for each group;
    - Estimates should include all routes and sources for exposure for each population and group (both near field and far field sources).
    - Estimates should include both acute (single day), and repeat dose (multiple days);
    - Doses are tracked by source (near field exposures to a product or far field exposures to emissions generated by the use of the chemical's use in a product, and other sources); and
    - Doses are tracked by route.
- Data on hazards associated with the chemical (to be obtained from RapidTox or other sources)
    - Data on dose response (point of departure, reference criteria (RfD, ADI, etc.), and when appropriate potency for non-threshold effects);
    - Estimates of the risk metrics (e.g., Hazard Index, MOE, MOS, and where appropriate lifetime cancer risks);
- Estimates of acute and long term internal doses (peak concentrations and average area under the curve in circulating blood);
- Access to ToxCast data; and
- Separate risk metrics should be defined for acute and chronic effects.

The LCA user

The HEM will support an LCA analysis. The LCA analysis may be performed in a variety of ways including:

1. The existing LCA methodology
    a. Characterize route-specific product intake fractions,
    b. Intake fractions for environmental releases,
    c. Mass of a compound emitted to the environment during use of consumer product, and
    d. Mass in a commercial product).
2. Toxicity is characterized using:
    a. Route-specific Effect Factors.
        i. Existing EF factors
        ii. Values of effect factors will be developed using in vitro, and in silico predictions of effects in 50% of the population..
    b. Data that will allow the weighting of characterization factors based on risk findings (CFs) are set to a *de minimis* value if MOEs or HI values for an exposure population fall within an acceptable range).
    c. Actual predictions of disease incidence rates from a use of a biological based dose response model.

In addition, the LCA user will require data on the other impacts evaluated in the LCA analysis. These include but are not limited to:

- Ozone depletion;
- Global climate change;
- Smog formation;
- Acidification of surface waters;
- Eutrophication;
- Fossil Fuel use;
- Energy use;
- Use of nonrenewable resources (Rare earths/ minerals);
- Land use; and
- Water use.

The actual determination of these impacts will not be performed in the HEM but any inputs related to these impacts that can be produced by HEM model will be provided to the LCA model.

Alternatives Assessor

The alternatives assessor will use the software to perform a comparison of the relative sustainability of multiple chemical candidates (or formulations) for use in a specific commercial product. Evaluations of alternatives are currently performed using a wide range of approaches. While an LCA-based approach, has a number of advantages, many alternative assessment are made based on potential for hazard, exposure, or risk. As a result, the alternatives assessor will require all of the outputs for the risk and LCA users.

The alternatives assessor will be performing three types of assessment.

1. Simple substitutions of a chemical by a set of candidate replacement chemicals.
2. Substitutions of candidate formulations for an existing formulation (changing multiple chemicals).
3. Comparison of a formulation to a non-chemical alternative.

B. Data the user will bring to the assessment

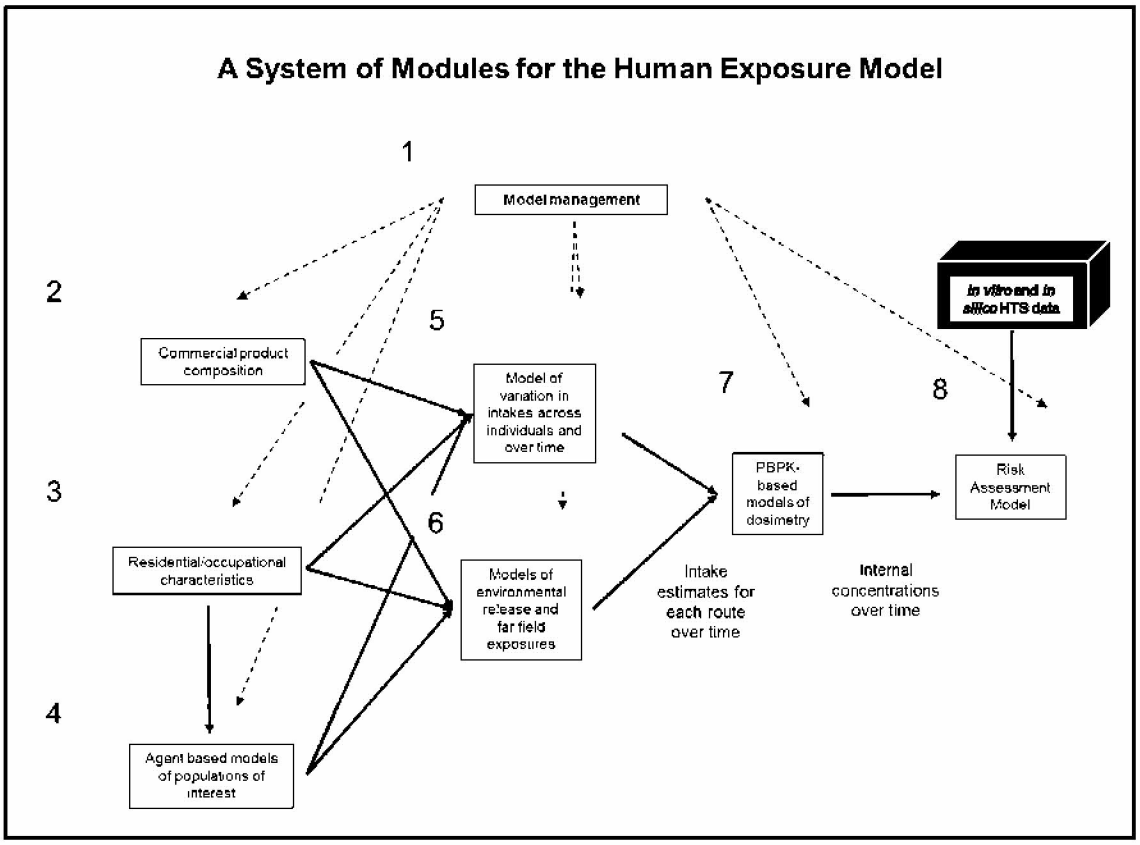
The risk assessor and other users may begin the analysis with different levels of information. The following analyses will be addressed by the HEM.

1. Assessing a chemical known to be used in a commercial product: A user knows the class of commercial products and a specific chemical is known to be used in the manufacture of the products.
2. Assess a chemical known to be used in commerce: User has no knowledge of how a chemical is used only that it is currently manufactured.
3. Assess a chemical that is known to be used in products used in an industrial sector or class of consumer products (e.g. automotive products or cosmetics).
4. Comparative assessment of multiple formulations (sets of chemicals and weight fractions)
    a. User knows the product and the compositions of the formulae.
    b. User knows the product and composition but weight fractions are unknown and must be estimated from the function each component plays.
5. User wishes to determine the impact of the exposures from the use of a chemical in a specific commercial product on the aggregate exposures of a chemical.

Design of the software

HEM will be designed as a series of modules and will run on a cloud. The modular form allows the adaption of code in multiple languages and on multiple platforms to be combined in one program. In addition, the

individual modules can be more easily reused by other programs. The specific number and design of the modules will be developed as part of the project. However, the following modules are likely to be used in the model. The relationships of the modules in the workflow are given in the following figure.



The dotted lines indicate the control that the model management module exerts on each of the modules. The solid lines indicate the movement of information between modules.

A. Management module (1)

This module manages the input of data and option choices from the user, the workflow of the program and the outputs.

B. Product composition module (2)

This module generates estimates of the weight fraction of the chemicals in the products of interest. The module will generate the estimates based on data wherever possible. The data will be contained in the CPCP and CPCAT databases and the databases generated by current research under RED. When there is no data on the presence of compound in any commercial product, the structure will be used to predict the likely presence and weight fraction of a compound in a class of products.

The module will also extract estimates of the physical and chemical properties of the chemicals of interest. This will be extracted from the physical/chemical property generator being developed by NCCT. The output of the module will be the chemical and product related information necessary to determine the intake dose calculations and the PBPK modeling.

C. Residential/occupational module (3)

This module will define the characteristics of the environments where the exposures occur. Specifically, the module will define the values of the inputs needed to develop dose estimates (room sizes, air exchange rates, etc.) and the characteristics that affect the probability of the use of products (e.g., presence of a lawn - requiring the use of pesticide and fertilizer, presence of a basement workspace where hobby related exposures could occur). These environments will be the residences of the simulated individuals in models of the general population.

A separate model will generate the inputs for the environments where occupational exposures occur.

D. Module of Agent-based models of consumer and occupational uses of products (4)

This module will contain models of the use of commercial products in the general population and in occupational populations. The models will generate descriptions of the individual, their physiology, and behaviors. The behaviors will define the time varying inputs to the dose intake models. The individuals will be varied based on information on inter-individual variation across a population.

This module will also use existing work developed under RED to generate the physiology of the individual. Where possible, data on variation in metabolism will also be generated in this module.

E. Module of dose intake modeling (5)

Exposure models for the general population and worker populations exposed during product use by consumers and commercial exposures will be derived from the dose engine currently in SHEDS HT. The module will generate the oral, inhalation, and dermal intake doses over time for each individual. The models will address interindividual variation and uncertainty in exposure using Monte Carlo modeling.

In the initial version of the software, exposure models of 1) occupational exposures during the synthesis of the chemical, 2) transport of the chemical, and 3) manufacture of the commercial product, and 4) product end-of-life exposures will be based on screening assessment approaches. These approaches either will assign the chemical/product formulations to a low concern or will flag the sources for additional analyses. Future versions will use actual models of variation in dose.

One of the needs for LCA is to determine the impact of background exposures to chemicals. Estimates of background will be taken from RED's estimates of aggregate exposures that occur from the use of all consumer products.

F. Far Field modeling (6)

This module will be based on the USETOX software model and will generate the doses from environmentally mediated exposures. The model will generate the estimate of releases that occur during each stage of the synthesis of the chemical and each stage in the lifecycle of the commercial product. The module will also generate the estimates of the Intake Fraction.

G. Module of PBPK models (7)

The use of toxicity data from toxicity in the 21st century will require that the traditional estimates of dose be extended to include estimates of internal exposures. This is done by developing ADME information for each

chemical and using the data in PK models of internal blood concentrations. The models will convert the longitudinal data on intake doses for each route into estimates of the time courses of blood concentrations. The time courses of intake and blood concentrations will be used to generate multiple dose metrics (e.g., systemic doses over specific time periods, concentrations in circulating blood over different averaging periods, Area under the cure for specific times, and peak concentrations). The PK models will incorporate the variation in physiological (e.g., body weight, fat percentage) and pharmacokinetic (e.g., metabolism rate, enzyme levels) variations in the population. Finally, the models will predict of levels of chemicals in blood, urine, and breath that can be compared to biomonitoring data.

The module will accept data on uncertainty and variation in dose. The model will propagate the uncertainty in the estimates of internal concentrations. The estimated of uncertainty and variation will also consider the impact of variation and uncertainty in ADME when data are available.

H. Risk characterization (8)

The level of toxicity information will determine if a risk characterization is possible and how the characterization will be expressed. If toxicity information is available from *in vivo* studies, the risk characterization could include finding of MOE, HQ, or HI. Cancer estimates may also be possible; but, the HEM will not be designed to estimate lifetime average doses and most of the populations assessed are limited to specific age ranges. If data are available from ToxCast or Tox21, then comparisons of *in vivo* data on bioactivity to blood concentrations are possible. If biologically based models of dose response are available, then such models may be applied to the time course estimates of internal dose.

I. Toxicity data

This module will either be a direct link to data in ACTOR or to a resource such as RapidTox. The module will generate the EF values for use in the LCA assessment.

Model evaluation and validation

The model sensitivities and uncertainties will be assessed for each integrated modeling framework. The models of formulae, residences, agent-based models of activity, in the various modules will generate estimates of human variability in the inputs to the dose estimates. This will be done by making models of separate individuals who vary in ways that represent population variation. The dose estimating and PBPK module will propagate this information on variation in doses and incorporate information on variation in metabolism. These predictions will be validated using biomonitoring data that is currently available (e.g., NHANES) or yet to be collected (e.g., by NIEHS/EPA Sister's Study Pilot project, Duke University's anticipated NIEHS-sponsored SVOC exposure and obesogens project).

In addition, predictions of patterns of use of consumer products can be validated using data on consumer purchases.

Conclusion

This effort is a work in progress. It is intended to begin the process of designing the software generating LCA-HEM project.

The work reflects comments and contributions from: Jane Bare, Susan Csiszar, Kathie Dionisio, Kristin Isaacs, Katherine Phillips, Gerry Laniak Caroline Ring, Cecilia Tan, Kent Thomas, Mike Tornero-Velez, Dan Vallero, and John Wambaugh.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-75

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-14-001	11/01/2013 To 10/31/2016 Base Option Period Number 2	Human Exposure Models

Contractor	Specify Section and paragraph of Contract SOW
ICF INCORPORATED, L.L.C.	C. 1

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [X] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 11/10/2015 To 10/31/2016

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (*Max 2*): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Cost/Fee:	LOE:
Contract Period: 11/01/2013 To 10/31/2016	$0.00	0
This Action:	$248,018.00	2,815
Total:	$247,918.00	2,815

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated: 11/30/2015	$248,018.00	2,815
Cumulative Approved:	$247,918.00	2,815

Work Assignment Manager Name: Daniel Vallero	(Signature)	(Date)	Branch/Mail Code: Phone Number: 919-541-3306 FAX Number:
Project Officer Name: Melissa Revely-Wilson	(Signature)	(Date)	Branch/Mail Code: Phone Number: 919-541-0207 FAX Number:
Other Agency Official Name	(Signature)	(Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: W. Dunn Gadson	(Signature)	12/24/15 (Date)	Branch/Mail Code: Phone Number: 513-487-2852 FAX Number: 513-487-2107

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-76

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-14-001	11/01/2013 To 10/31/2016	Air Pollutants
	Base Option Period Number 2	

Contractor	Specify Section and paragraph of Contract SOW
ICF INCORPORATED, L.L.C.	C

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 11/10/2015 To 10/31/2016

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (*Max 2*) ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
11/01/2013 To 10/31/2016		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name Robert Devlin (Signature) (Date)	Branch/Mail Code: Phone Number 919-966-6255 FAX Number:
Project Officer Name Melissa Revely-Wilson (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8523 FAX Number: 703-347-8696
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name Adam Meier (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2852 FAX Number: 513-487-2107

PERFORMANCE WORK STATEMENT
CONTRACT NO. EP-C-14-001
WA 2-76

TITLE: Analysis of Metabolites Altered by Exposure of Humans to Air Pollutants

---

Principal Section & Paragraph of SOW: ***A.2.***

PERIOD OF PERFORMANCE: 11/10/2015 0 10/31/2016

I. PURPOSE

The purpose of the work assignment is to provide services to the U.S. Environmental Protection Agency's (EPA) Office of Research and Development (ORD), specifically to characterize metabolites found in bronchoalveolar lavage samples obtained from humans exposed to air pollutants, and analyze the metabolomic data for significant changes as well as identify specific metabolomic pathways that are altered by air pollutants. These data will assist the National Center for Environmental Assessment (NCEA) in understanding the mechanisms by which air pollutants cause adverse effects in humans, and will be included in the next ozone and particulate matter (PM) Integrated Science Assessments (ISAs) prepared by NCEA.

II. BACKGROUND

The EPA is engaged in research to characterize adverse health effects caused by exposure to inhaled pollutants, including PM. A key part of this research is to characterize mode of action and mechanisms by which these pollutants cause adverse health effects. To accomplish this, ORD conducts controlled human exposure studies in which volunteers are exposed to ozone or PM and clean air on separate days. Physiological measurements are taken (e.g. lung function, ECG), and biological samples (e.g. blood, bronchoalveolar lavage fluid) are collected and assayed to for pollutant-induced changes. Understanding changes in metabolites (small soluble chemicals such as amino acids, nucleotides, byproducts of cell metabolism) have become increasingly important, since they can identify specific biological pathways that have been altered by pollutants. This information is included in ISAs for ozone and PM prepared by NCEA and used by the Office of Air and Radiation (OAR) in the National Ambient Air Quality Standard (NAAQS) setting process.

III. SCOPE OF WORK: TASKS AND DELIVERABLES

Establish Communication Within 3 days of start date of this WA, the Contractor shall schedule a conference call (not to exceed 1 hour) with the WAM and appropriate contractor staff to clarify outstanding questions and confirm the schedule and specific tasks. The Contractor shall prepare a written work plan describing how the tasks in this PWS will be performed, including a schedule, budget, level of effort, and qualifications of personnel. If the contractor does not have in-house expertise to accomplish this work assignment, the Work Plan shall describe an approach for identifying a suitable sub-contractor, and ascertaining the cost of the subcontract. This work assignment entails the use of human specimens, but the samples are de-identified (i.e. all HIPAA

personal identifiers have been removed) and therefore has been declared not human research. The Contractor shall maintain communication with the WAM through weekly phone calls or email updates.

Task 1. Preparation of Samples for Mass Spectrometry

Samples (120) will be sent to the contractor where they will be stored at –80°C until processed. Recovery standards shall be added prior to the first step in the extraction process for quality control purposes. To remove protein, dissociate small molecules bound to protein or trapped in the precipitated protein matrix, and to recover chemically diverse metabolites, proteins shall be precipitated with methanol under vigorous shaking followed by centrifugation. Extracts shall be stored at –80°C until they are analyzed by mass spectrometry (MS).

Task 2. Mass Spectrometry Analysis

To ensure identification of the maximum number of metabolites, the extract shall be divided into five fractions: two (i.e., early and late eluting compounds) for analysis by ultra-high performance liquid chromatography-tandem mass spectrometry (UPLC-MS/MS; positive ionization), one for analysis by UPLC-MS/MS (negative ionization), one for the UPLC-MS/MS polar platform (negative ionization), and one sample reserved for backup. MS Peaks shall be quantified using area under the curve. Metabolites represented by the peaks shall be identified by automated comparison of the ion features in the experimental samples to a reference library of chemical standard entries that includes retention time, molecular weight (m/z), preferred adducts, and in-source fragments as well as associated MS spectra and curated by visual inspection for quality control. To ensure the identification of the maximum number of metabolites, the reference library shall contain a minimum of 3000 commercially available standard metabolites.

Task 3. Data Analysis

Analysis shall utilize appropriate statistical tests (e.g. principal component analysis, Random Forest classification analysis) to identify metabolites that are altered by exposure to air pollutants. Appropriate software shall be used to assign biological pathways for each metabolite, allowing statistical examination of over or under-represented pathways. The EPA shall provide the contractor with the overall study design and whether a sample was collected following a person's exposure to clean air, ozone or PM.

Task 3. Deliverables and Due Dates

- A Word document describing the study parameters and an executive summary and biological interpretation of the results and statistical tables. This document shall contain extensive general information about the MS platform that was used and the statistical methods applied.
- A PowerPoint presentation file with figures illustrating key points and major metabolic pathways singled out in the results.
- An Excel file that includes the data tables, statistical results, and box plot images for observed metabolitess. The tables (both raw data and raw imputed data) shall contain all compound parameter information (identifiers, mass, retention index, metabolic pathway designations, etc). The results of statistical comparisons and the fold change ratios for all compounds, when applicable, shall be provided in a "heat map" format, with compounds grouped by general biochemical pathway.

All deliverables are due within 90 days of the approval of the work assignment unless given alternative due dates via technical direction.

IV. SPECIAL CONDITIONS AND ASSUMPTIONS

The contractor shall provide regular updates on progress and any issues that need to be resolved to the WAM by telephone or by email. Any technical directions made during informal discussions shall be issued promptly by the EPA WAM in writing (to include email). Typical cost for performing tasks 1-3 by companies that specialize in metabolite analysis are usually about $300 per sample. Although there are likely several subcontractors with expertise in this area, the EPA has sent samples to Metabolon (located in RTP) for metabolite analysis in the past and been pleased with the results.

V. EPA CONTACTS

Robert Delvin, WA-COR, 919-966-6255
Michael Schmitt, Alternate WA-COR, 919-966-0647

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-76

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-14-001	11/01/2013 To 10/31/2016 Base Option Period Number 2	Exposure of Humans

Contractor	Specify Section and paragraph of Contract SOW
ICF INCORPORATED, L.L.C.	C

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [X] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 11/10/2015 To 10/31/2016

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Cost/Fee:	LOE:
Contract Period: 11/01/2013 To 10/31/2016	$0.00	0
This Action:	$47,542.00	38
Total:	$47,542.00	38

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated: 12/14/2015	$47,542.00	38
Cumulative Approved:	$47,542.00	38

Work Assignment Manager Name: Robert Devlin (Signature) (Date)	Branch/Mail Code: Phone Number: 919-966-6255 FAX Number:
Project Officer Name: Melissa Revely-Wilson (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-0207 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: William Gates 12/24/15 (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2852 FAX Number: 513-487-2107

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-77

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-14-001	11/01/2013 To 10/31/2016	Standards for Pathogens
	Base Option Period Number 2	

Contractor	Specify Section and paragraph of Contract SOW
ICF INCORPORATED, L.L.C.	III.D, III.E.1, III.G

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 11/01/2015 To 10/31/2016

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (*Max 2*): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 11/01/2013 To 10/31/2016 — Cost/Fee: — LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: — Cost/Fee: — LOE:

Cumulative Approved: — Cost/Fee: — LOE:

Work Assignment Manager Name: Gary Russo (Signature) (Date)	Branch/Mail Code: Phone Number: 202-566-1335 FAX Number:
Project Officer Name: Melissa Revely-Wilson (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8523 FAX Number: 703-347-8696
Other Agency Official Name: (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Adam Meier (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2852 FAX Number: 513-487-2107

PERFORMANCE WORK STATEMENT
CONTRACT NO. EP-C-14-001
WA 2-77

TITLE: Secondary Contact Water Quality Standards for Pathogens

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Principal Section & Paragraph of SOW: III.D, III.E.1, III.G

PERIOD OF PERFORMANCE: November 1, 2015 – October 31, 2016

Background:

EPA's bacteriological water quality criteria under section 304(a) of the Clean Water Act (CWA) address water quality standards for "primary contact" recreational uses and do not significantly address "secondary contact" recreational uses. Primary contact recreation is typically defined as water-based recreational activities that could be expected to result in the ingestion of or immersion in water such as swimming, water skiing, or surfing. Secondary contact recreation is typically defined as water-based recreational activities where contact with the water is either incidental or accidental, and the probability of ingesting appreciable quantities of water is minimal.

Current EPA policy allows States, tribes and territories to adopt bacteriological criteria for secondary contact uses that are less stringent than criteria for primary contact uses. The justification for less stringent secondary contact criteria is based on the assumption that secondary contact activities are associated with exposure to fewer pathogenic organisms. It is believed that a higher concentration of pathogens in water is counterbalanced by a lower potential exposure to those pathogens, resulting in the same risk of illness in secondary recreational activities as risks associated with primary recreational activities. However, the potential for pathogen exposure during different recreational activities is not well characterized, and there is currently no scientific consensus on whether or not they are in fact associated with different risks of illness (differential risk).

Although there is a body of scientific literature addressing the risk of illness associated with various water-based recreational activities, the relationships between different activities, water quality, and health risks are not well understood. The wide ranges of existing studies often have ambiguous results or support conflicting conclusions. Such ambiguity and/or disagreement may be due to a variety of reasons, including differences in the questions being addressed, differences, biases and/or flaws in the way the studies were designed or conducted, differences in interpretation of the study results, or simply due to chance.

The purpose of this project is to examine the evidence for or against differential risk by conducting a systematic review. A systematic review is a specific type of literature review that focuses on a specific research question and tries to identify, appraise, select and synthesize all high quality research and evidence relevant to that question. The overall goal of a systematic review is to provide an objective and transparent synthesis of research results that minimizes bias. The systematic review will provide an up-to-date, state-of-the-art evaluation of the current scientific knowledge of the health risks associated with different water-based recreational activities in water contaminated by fecal material. The results and conclusions of the systematic review will be used to

inform EPA policies and decisions associated with recreational water quality standards for the protection of public health.

The majority of the work for this project has already been performed and deliverables were already provided in conjunction with previous work assignments on a different contract with ICF (contract EP-C-11-005 work assignments 1-10, 2-10, 3-10, and 4-10). The purpose of this work assignment is to make progress toward completion of the project.

Performance Work Statement (PWS):

The scope of work in this PWS will fall under the following tasks:

Task 1 – Work plan, quality assurance, and monthly progress reports

Task Area 1.2 - Work plan

The contractor shall develop a work plan to address all tasks in the PWS. The work plan shall include a schedule, staffing plan, level of effort (LOE), and cost estimate for each task, the contractor's key assumptions on which staffing plan and budget are based, and qualifications of proposed staff. If one or more subcontractor(s) are proposed and they are outside the metropolitan DC area, the contractor shall include information on plans to manage work and contract costs. The number and professional level of hours charged and total dollars for each task will be provided. Other costs greater than $100.00 shall be itemized.

- Deadline – Twenty (20) calendar days after receipt of work assignment

Task Area 1.3 - Quality assurance

Work assignments 1-10, 2-10, 3-10, and 4-10 under contract EP-C-11-005 required the use of existing data. Consistent with the Agency's quality assurance (QA) requirements, the contractor developed a contract-level quality assurance project plan (QAPP) and project-level QAPP to assure the quality of the existing data or any other types of data used in these work assignments. The contractor addressed the project-specific QA requirements in the previous work plans and monthly progress reports following Attachment 1 entitled: "QAPP requirements for projects using existing data." The QAPPs were approved by the EPA before activities using existing data began. In addition to the project-specific QAPP, the contractor developed a systematic review protocol that contained QA and quality control (QC) procedures for implementing the systematic review. **The contractor shall continue to implement all QA and QC procedures specified in the contract-level QAPP, project-level QAPP, and systematic review protocol for all work performed under this PWS.**

Upon completion of the systematic review, the contractor shall complete the EPA Office of Water Information Quality Guidelines checklist and supporting narrative (see Attachment 2).

- Deliverable – Completed Information Quality Guidelines checklist
- Deadline – Seven (7) calendar days following technical direction from EPA WAM.

Task 2 – Finalize and publish systematic review

Task Area 2.1 - Finalize draft manuscript

The contractor shall finalize the draft manuscript developed during the previous work assignment for submission to a scientific journal. The manuscript shall be organized thoughtfully, written concisely, grammatically correct, academically rigorous, contain high quality tables and figures when appropriate, and formatted for the journal being targeted. The contractor shall develop the manuscript in a way that provides for relatively simple reformatting for submission to other scientific journals if needed.

- Deliverable – Final manuscript.
- Deadline – Thirty (30) days after receiving direction from the EPA WAM to begin finalizing the draft manuscript.

Task Area 2.2 - Revisions in response to peer-review

After submission of the manuscript to the scientific journal, the journal will assign peer-reviewers who will review the manuscript and provide EPA with comments. The contractor shall work closely with the EPA WAM to determine the appropriate manuscript revisions in response to reviewer comments. Once EPA determines the appropriate manuscript revisions, the contractor shall revise the manuscript in response to the reviewer comments as instructed by the EPA WAM. The contractor shall only make those revisions directed by the EPA WAM. The contractor shall conform to the same standards of quality when revising the manuscript as specified above for finalizing the manuscript.

- Deliverable – Revised manuscript.
- Deadline – Thirty (30) days after contractor receives review comments and instructions from EPA WAM to begin manuscript revisions.

Task Area 2.3 - Response to reviewer comments

The contractor shall work closely with the EPA WAM to develop point-by-point written responses to reviewer comments for submission to the journal editor. The contractor shall also prepare the Information Quality Guidelines Checklist necessary for products that EPA disseminates to the public under EPA's Information Quality Guidelines.

- Deliverable – Response to comments document and Information Quality Guidelines Checklist..
- Deadline – Fifteen (15) days after manuscript revisions are completed and the contractor receives written instruction from the EPA WAM to begin development of response to comments.

Task Area 3 - General Project Support

Task Area 3.1 - Prepare briefing materials and other supporting documents pertaining to the systematic review

Briefing materials and other supporting documents will be needed during the systematic review development process and after the review is published. The contractor shall aid in the development of any materials or

presentations for these purposes. This may include but is not limited to preparing interim project updates and other materials for internal and external audiences as requested by the EPA WAM, briefing documents, PowerPoint presentations, and other supporting documents as needed. The contractor may be requested by the EPA WAM to participate in and/or conduct briefings or participate in seminars or talks related to the systematic review.

- Deliverable – Requested materials and supporting documents.
- Deadline – As mutually agreed upon by the EPA WAM and contractor

Task Area 3.2 - Support options development and analyses for potential changes to EPA policies related to bacteriological water quality standards.

As the results and conclusions of the systematic review become clear, the EPA may want to consider alternative policies related to bacteriological water quality standards. The contractor shall aid in the development of potential alternative policy options. These activities may include, ,but are not limited to, performing additional research and analysis of existing scientific data and information, analysis of the potential public health outcomes resulting from policy modifications, and the analysis of water quality standard implementation implications associated with the adoption of alternative bacteriological water quality standards. The contractor may be requested to participate in and/or conduct briefings or other presentations related to this work.

- Deliverable – Requested materials.
- Deadline – As mutually agreed upon by the EPA WAM and contractor

Travel:

Travel may be needed as deemed necessary by the EPA WAM. No contractor travel outside of the Washington, D.C. metro area is required.

General Requirements of the Work Assignment and Schedule:

Due Dates

The contractor shall mutually acceptable due dates with EPA WAM. The contractor shall notify the EPA WAM in advance, if a due date will not be met and negotiate a mutually acceptable revised due date.

Delays

The contractor shall provide sufficient qualified man-power to ensure there are no avoidable delays. If a delay outside the control of the contractor is unavoidable, the contractor shall immediately notify the EPA WAM and negotiate a mutually acceptable revised schedule.

Draft Documents

The contractor shall submit draft or interim work products requested by the EPA WAM. Draft or interim work products shall be prepared in an electronic format compatible with Microsoft Office 2013 and Endnote X. The EPA WAM will provide the contractor with comments on draft work products in electronic format. Work products shall be deemed draft until designated as final by the EPA WAM.

Final Documents

The contractor shall submit final documents electronically to the EPA WAM.

Meetings, Conferences, Training Events, Award Ceremonies and Receptions:

All appropriate clearances and approvals required by Agency policy in support of any and all conference related activities and expenses, including support of meetings, conferences, training events, award ceremonies and receptions, shall be obtained by the EPA WAM as needed and provided to the Contracting Officer. Work under conference related activities and expenses shall not occur until this approval is obtained and provided by the EPA WAM.

Work Assignment Manager (WAM): Gary Russo (Mail Code 4305T)
Standards and Health Protection Division
Office of Water, Office of Science and Technology
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460
Phone (202) 566-1335
E-mail: russo.gary@epa.gov

Alternate WAM: Shari Barash (Mail Code 4305T)
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Office of Water, Office of Science and Technology
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460
Phone (202) 566-0996
E-mail: barash.shari@epa.gov

ATTACHMENT 1

QAPP Requirement for Projects Using Existing Data

A project involving existing data gathers and uses existing data for purposes other than those for which they may have been originally collected. These existing data may be obtained from many sources including literature, industry, computerized databases and information systems, and computerized or mathematical models of environmental processes. For projects that use existing data, a QAPP shall be prepared that includes the requirements identified below. If primary data will also be generated as part of the project, then the information below can be incorporated into the associated QAPP to address the existing data. The following requirements should be addressed as applicable.

Section 1. Project Objectives, Organization, and Responsibilities

1.1 The purpose of study shall be clearly stated.
1.2 Project objectives shall be clearly stated.

1.3 The existing data needed to satisfy the project objectives shall be identified. Requirements relating to the type of data, the age of data, geographical representation, temporal representation, and technological representation, as applicable, shall be specified.

1.4 The planned approach for evaluating project objectives, including formulas, units, definitions of terms, and statistical or other types of data analysis. Assumptions and or recommendations based on the data analysis shall also be included if applicable.

1.5 Responsibilities of all project participants shall be identified, meaning that key personnel and their organizations shall be identified, along with the designation of responsibilities for planning, coordination, data gathering, data analysis, report preparation, and quality assurance, as applicable.

Section 2. Sources of Existing Data

2.1 The source(s) of the existing data must be specified.
2.2 The rationale for selecting the source(s) identified shall be discussed.
2.3 The sources of the existing data will be identified in any project deliverable.

Section 3. Quality of Existing Data

3.1 Quality requirements of the existing data must be specified. These requirements must be appropriate for their intended use. Accuracy, precision, representativeness, completeness, and comparability need to be addressed, if applicable. (If appropriate, a related QAPP containing this information can be referenced.)

3.2 The procedures for determining the quality of the existing data shall be described.

3.3 If no quality requirements exist, this shall be stated in the QAPP. If no quality requirements exist or if the quality of the existing data will not be evaluated by EPA, the QAPP shall require that a disclaimer be

added to any project deliverable to indicate that the quality of the existing data has not been evaluated by EPA for this specific application. The wording for the disclaimer shall be defined.

Section 4. Data Reporting, Data Reduction, and Data Validation

4.1 Data reduction procedures specific to the project shall be described, including calculations and equations.

4.2 The data validation procedures used to ensure the reporting of accurate project data shall be described.

4.3 The expected product document that will be prepared shall be specified (*e.g.*, journal article, final report, *etc.*).

ATTACHMENT 2

Office of Water

Information Quality Guidelines:

Pre-Dissemination Review Guidance and Checklists

version 2.2 (January 10, 2003)

BACKGROUND

In order to comply with Section 515 of the Treasury and General Government Appropriations Act for FY 2002 (Public Law 106-554), the Office of Management and Budget developed guidelines that "provide policy and procedural guidance for ensuring and maximizing the quality, objectivity, utility, and integrity of information, including statistical information, disseminated by Federal agencies."

In response to OMB's guidelines (FRL-7157-8, March 2002), EPA developed the *Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by the Environmental Protection Agency* (The Guidelines), which contains EPA's policy and procedural guidance for ensuring and maximizing the quality of the information we disseminate. "Quality" refers to objectivity, integrity, and utility.

The Guidelines also:

- Outline administrative mechanisms for EPA pre-dissemination review of information products.
- Enable affected persons to file complaints regarding disseminated information that they believe to be noncompliant with EPA's Guidelines.

Implementation began ***October 1, 2002***.

For more information, visit http://www.epa.gov/oei/qualityguidelines/

In order to ensure that information meets The Guidelines, the following guidance and checklists should be used prior to dissemination.

OVERVIEW

- What information is covered under The Guidelines?

- Is your organization in compliance with EPA's existing Quality System and Office of Water's Quality Management Plan?
- What type of information do I have?
- Do additional guidelines apply for externally gathered data?
- Checklists for Pre-Dissemination Review
- What are Requests for Correction and Requests for Reconsideration, and how does OW respond to them?

WHAT INFORMATION IS COVERED UNDER THE GUIDELINES?

These guidelines apply only to *information* EPA *disseminates* to the public.

What DO The Guidelines cover?

- EPA prepares the information and distributes it to support or represent EPA's viewpoint, or to formulate or support a regulation, guidance, or other Agency decision or position.
- EPA distributes information prepared or submitted by an outside party in a manner that reasonably suggests that EPA endorses or agrees with it.
- EPA reviews and comments on information distributed by an outside party in a manner that indicates EPA is endorsing it, directs the outside party to disseminate it on EPA's behalf, or otherwise adopts or endorses it.

What DON'T The Guidelines cover?

- Distribution of information for government employees
- EPA response to FOIA, FACA, or similar legislation
- Correspondence directed to individuals or persons
- Information presented solely to Congress
- Ephemeral information (press releases, fact sheets, press conferences)
- Background information (published articles distributed by libraries, or other non-EPA endorsed distributions)
- Information distributed by recipients of EPA grants, contracts, or cooperative agreements *unless* EPA adopts or endorses the information
- Information in public filings, including information submitted to EPA, either voluntarily or under mandates/requirements
- Distribution of information in judicial cases or administrative adjudication

IS YOUR ORGANIZATION IN COMPLIANCE WITH EPA'S EXISTING QUALITY SYSTEM AND OFFICE OF WATER'S QUALITY MANAGEMENT PLAN?

Many of EPA's current quality assurance practices fulfill much of EPA's Information Quality Guidelines. Examples of these policies are: Quality System, Peer Review, Action Development Process, Integrated Error Correction Process, Information Resources Management Manual, Risk Characterization Policy and Handbook, Program-Specific Policies, and EPA's Commitment to Continuous Improvement. EPA information disseminated to the public must meet EPA's already existing Quality System and other related policies. The Quality System utilizes a graded approach to establish quality criteria that are appropriate for the intended use of the information and the resources available. (The Quality System can be found in EPA Order 5360.1 A2, "Policy and Program Requirements for the Mandatory Agency-wide Quality System" and in the "EPA Quality Manual".)

The Quality System requires Agency organizations to:

- Assign a quality assurance manager
- Develop a Quality Management Plan
- Conduct an annual assessment of the organization's quality system
- Use a systematic planning process to develop acceptance or performance criteria prior to the initiation of all projects that involve environmental information collection and/or use
- Develop Quality Assurance Project Plans for all applicable projects and tasks involving environmental data
- Conduct an assessment of existing data, when used to support Agency decisions or other secondary purposes, to verify accuracy
- Implement all Agency-wide Quality System components in all applicable EPA-funded extramural agreements
- Provide appropriate training for all levels of management and staff

The Office of Water implements EPA's Quality System through its Quality Management Plan, approved by OEI in September 2001. Please refer to this document to ensure that the information you are disseminating complies with Office of Water quality assurance policies.

WHAT TYPE OF INFORMATION DO I HAVE?

Different quality standards apply to influential information, influential scientific risk assessment information, and non-influential information. The definitions of these three types of information are:

Influential: when the Agency can reasonably determine that dissemination of the information will have a clear and substantial impact on important public policies or private sector decisions. These include OMB economically significant actions, peer reviewed documents, top Agency policy documents, and other actions on a case-by-case basis. Influential information must meet a higher standard of quality: "reproducibility".

Reproducibility: providing enough information to allow the public to reproduce our analyses

Influential Scientific Risk Assessment: applies to all dissemination of information regarding human health, environmental, or safety risk assessments, *except* those conducted under the Safe Drinking Water Act, which will adhere to SDWA principles. Information is required to be accurate, reliable, and unbiased; it should also be comprehensive, informative, and understandable. The quality standard is "objectivity," and uses the following principles:

- Information is accurate, reliable, and unbiased. This involves:
    - Best available science, which utilizes sound and objective scientific practices, and peer review when available
    - Data collection by accepted methods
- Presentation of information is consistent with the purpose of the information, is comprehensive, informative, and understandable. This means specifying:
    - each population addressed by the risk
    - expected risk or central estimate
    - upper-bound and lower-bound estimate of risk
    - significant uncertainties identified
    - peer reviewed studies known to the Administrator

Non-Influential: standard of quality is "transparency."

Transparency: the public can understand how conclusions were obtained on the information

DO ADDITIONAL GUIDELINES APPLY FOR EXTERNALLY GATHERED DATA?

Most external environmental data is within the scope of the Quality System. This includes literature, industry surveys, compilations from computerized databases and information systems, and results from computerized or mathematical models of environmental processes and conditions.

Regarding voluntarily submitted information, EPA will continue to work with States and other governments, the scientific and technical community, and other interested information providers to develop and publish criteria the EPA would use to assess this type of information.

Depending on your information, you need only fill out ONE of the following three checklists. Please forward the checklists to OW's Information Quality Guidelines Officer (currently Leo Gueriguian, 564-0388) for approval and signature. The checklist must then be signed by your Division Director, and a copy sent to your Quality Assurance Officer. Please also note that outside entities may file Requests for Correction (i.e. complaints) to EPA, citing non-compliance with EPA's Information Quality Guidelines.

Note: OGWDW staff should send their completed checklists directly to their Division Directors. They should work with the OW IQ Guidelines Officer, as their projects and checklists are being developed.

Office of Water

Information Quality Guidelines Checklist for

Influential Information

Influential Information has or will have a clear and substantial impact on important public policies or private sector decisions. (Includes OMB economically significant actions, peer reviewed documents, top Agency policy documents, and other actions on a case-by-case basis.)

- ❑ The information to be disseminated is covered under The Guidelines.
- ❑ The information is in compliance with EPA's Quality System and other related policies.
- ❑ The information is in compliance with Office of Water's Quality Management Plan.
- ❑ The information is consistent with the OMB definition of "quality," meaning the information has a high level of objectivity, utility, and integrity.
  - ❑ Objectivity: information is presented in an accurate, clear, complete, and unbiased manner, and as a matter of substance, is accurate, reliable, and unbiased.
  - ❑ Integrity: the information cannot be compromised through corruption or falsification because it is secure from unauthorized access or revision.
  - ❑ Utility: the information is useful to the intended users.

- ❑ The information meets "reproducibility" standard.
  The information and its accompanying documentation has a higher degree of transparency regarding the following:
  - ❑ The source of the data used
  - ❑ The various assumptions employed
  - ❑ The analytic methods applied
  - ❑ The statistical procedures employed

_____ _____

Division Director's Signature & Date

IQG Officer for OW Signature & Date

(Officer signature Not needed for OGWDW staff)

**If your information does not comply with any of these items, please attach brief explanation of any omissions. Please forward a copy of this document to your office's Quality Assurance Officer.

version 2.2 (January 10, 2003)

Office of Water

Information Quality Guidelines Checklist for

Influential Risk Assessment Information

Influential Scientific Risk Assessment Information has or will have a clear and substantial impact on important public policies or private sector decisions. (Includes OMB economically significant actions, peer reviewed documents, top Agency policy documents, and other actions on a case-by-case basis.)

- ❑ The information to be disseminated is covered under The Guidelines.
- ❑ The information is in compliance with EPA's Quality System and other related policies.
- ❑ The information is in compliance with Office of Water's Quality Management Plan.
- ❑ The information is consistent with the OMB definition of "quality," meaning the information has a high level of objectivity, utility, and integrity.
  - ❑ Objectivity: information is presented in an accurate, clear, complete, and unbiased manner, and as a matter of substance, is accurate, reliable, and unbiased.
  - ❑ Integrity: the information cannot be compromised through corruption or falsification because it is secure from unauthorized access or revision.
  - ❑ Utility: the information is useful to the intended users.

- ❑ The information meets "objectivity" standard.
  - ❑ The information is accurate, reliable, and unbiased:
    -best available science and supporting studies conducted using sound and objective scientific practices, including peer reviewed studies

    -data were collected by accepted methods or best available methods (if the method's reliability nature of the decision justifies the use of the data)

  - ❑ Presentation of information on human health, safety, or environmental risks, consistent with the purpose of the information, is comprehensive, informative, and understandable. Each of the following must be specified:
    -each population addressed by the risk or each risk assessment endpoint addressed by any estimate of applicable ecological risk

    -expected risk or central estimate for the specific populations affected or the ecological assessment endpoints

    -upper-bound and lower-bound estimate of risk

    -significant uncertainties identified, and studies that would assist in resolving uncertainties

-peer reviewed studies known to the Administrator that support, are directly relevant to, or fail to support any estimate of risk and the methodology used to reconcile inconsistencies in the scientific data

Division Director's Signature & Date

IQG Officer for OW Signature & Date

(Officer signature Not needed for OGWDW staff)

**If your information does not comply with any of these items, please attach brief explanation of any omissions. Please forward a copy of this document to your office's Quality Assurance Officer.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-77

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-14-001	11/01/2013 To 10/31/2016 Base Option Period Number 2	Secondary Contact Water Qualit

Contractor	Specify Section and paragraph of Contract SOW
ICF INCORPORATED, L.L.C.	III.D, III.E.1, III.G

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [X] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 11/01/2015 To 10/31/2016

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

SFO (*Max 2*): ☐

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code
1										
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5										

Authorized Work Assignment Ceiling

	Cost/Fee	LOE
Contract Period: 11/01/2013 To 10/31/2016	$0.00	0
This Action:	$123,063.00	1,120
Total:	$123,063.00	1,120

Work Plan / Cost Estimate Approvals

	Cost/Fee	LOE
Contractor WP Dated: 11/20/2015	$123,063.00	1,120
Cumulative Approved:	$123,063.00	1,120

Work Assignment Manager Name: Gary Russo (Signature) (Date)		Branch/Mail Code:
		Phone Number: 202-566-1335
		FAX Number:
Project Officer Name: Melissa Revely-Wilson (Signature) (Date)		Branch/Mail Code:
		Phone Number: 919-541-0207
		FAX Number:
Other Agency Official Name (Signature) (Date)		Branch/Mail Code:
		Phone Number:
		FAX Number:
Contracting Official Name: Adam Meier (Signature) (Date)		Branch/Mail Code:
		Phone Number: 513-487-2852
		FAX Number: 513-487-2107

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-78

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-14-001	11/01/2013 To 10/31/2016	SHEDS-HT
	Base Option Period Number 2	

Contractor: ICF INCORPORATED, L.L.C.

Specify Section and paragraph of Contract SOW: B - Risk Assessment Methods Research and Developme

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 11/05/2015 To 10/31/2016

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (*Max 2*) ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
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Authorized Work Assignment Ceiling

Contract Period: 11/01/2013 To 10/31/2016 — Cost/Fee: — LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: — Cost/Fee: — LOE:

Cumulative Approved: — Cost/Fee: — LOE:

Work Assignment Manager Name: Kristin Isaacs (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-2785 FAX Number:
Project Officer Name: Melissa Revely-Wilson (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8523 FAX Number: 703-347-8696
Other Agency Official Name: (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Adam Meier (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2852 FAX Number: 513-487-2107

PERFORMANCE WORK STATEMENT
CONTRACT NO. EP-C-14-001
WA 2-78

TITLE: Development or Refinement of SHEDS-HT Model Software, Data, and Documentation

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Specify Section & Paragraph SOW: B - Risk Assessment Methods Research and Development

PERIOD of PERFORMANCE: 11-5-15 – 10-31-16

Note: This PWS describes the continuation of a PWS initiated under OPTION PERIOD 1.

Background

EPA has been developing novel approaches and tools for evaluating, screening and classifying chemicals for the Chemical Safety for Sustainability (CSS) Program based on the potential for biologically-relevant human exposures, for the purpose of informing toxicity testing and prioritization for risk assessment. Program Offices and other Stakeholders need the ability to readily use a flexible and integrated source-to-dose-to-effects model with more realistic exposure modules for evaluating, screening and ranking risks from chemical exposures of different population and age groups.

NERL has developed an efficient and more generalizable high-throughput version of the Stochastic Exposure and Dose Simulations (SHEDS) modeling tool ("SHEDS-HT"). SHEDS-HT is being designed to fill critical gaps in data and numerical algorithms in order to comprehensively characterize key human exposure pathways within a multi-tier and efficient modeling framework. As part of a collaboration with NCCT's ExpoCast project, SHEDS results will be evaluated and incorporated into calibrated consensus exposure predictions within the Systematic Empirical Evaluation of Models (SEEM) framework.

The focus of this project will be to further develop and refine the SHEDS-HT model, its input data, its output data, and its documentation with respect to its 1) chemical space capabilities 2) its suitability for use in new areas of research such as cumulative exposure assessment and life cycle assessment (LCA) projects and case studies.

The WACOR is authorized to provide technical direction in accordance with the contract. This PWS instructs the Contractor to perform the tasks described below.

I. Description of Tasks

Task 3. Modify and Test SHEDS-HT to Enable Applicability to Cumulative Exposure Predictions or Life Cycle Analyses

The Contractor shall modify the SHEDS-HT R code (with corresponding appropriate testing and quality assurance) to implement identified improvements to algorithms, exposure scenarios, or other model features to expand both the utility of the model and chemical and scenario domain of applicability.

Task 3a. Update SHEDS-HT for Food Contact Materials or Other Exposure Scenarios.
The contractor will implement code to add a dietary exposure scenario to the main SHEDS-HT model to

address Food Contact Materials (FCMs) or food additives. This may involve updating the format and content of SHEDS-HT dietary diaries, adding additional subroutines for calculation of exposures and resulting intakes via the dietary pathway, implementing subroutines or QSAR models for calculation of migration rate, and/or altering the SHEDS-HT output files. The WA-COR will provide technical direction on the specific changes to be made to SHEDS-HT.

Task 3b. Update SHEDS-HT for Occupational (Industrial or Professional) Exposures. Under a separate WA, the contractor will be investigating the feasibility of modifying SHEDS-HT for estimating occupational exposures in both industrial and professional settings. This may include changes to SHEDS-HT algorithms and/or input data (e.g., additional methods for handling definitions of microenvironments and microenvironmental properties or defining products and product uses specific to occupational exposures.) Based on the suitability of the model for such a purpose, under this WA the Contractor will then make any final changes to the SHEDS code and documentation to implement these exposure pathways.

Task 3C. Implement New Output Information for SHEDS-HT to Support Life Cycle Assessment (LCA) Projects. Under the direction of the WA-COR, the Contractor shall implement into the official SHEDS-HT R code and documentation any new output metrics needed to support LCA Human Exposure Metrics, specifically product intake fractions or other metrics developed under a separate LCA WA.

Task 3D. **Investigate the Potential for Providing Individual Product-Level Information to SHEDS-HT**. The current SHEDS-HT source file operates on a product-category basis, with distributions of key parameters (e.g., prevalences and weight fractions) provided on an aggregated basis. The contractor shall investigate the potential for SHEDS-HT to accept required information on an individual product basis, which would allow for the ultimate incorporation of product-specific market share and composition information.

Task 4. Develop a Distributable R Package of SHEDS-HT

The Contractor shall take the existing SHEDS-HT R code and input files and convert it into a distributable R package format for uploading to the CRAN R repository. The WA-COR will provide technical direction as to which input files to provide as default information and which SHEDS-HT routines to provide as public tools. The Contractor will follow all CRAN standards for R packages with respect to function definition, help information for each function, definition of public versus hidden functions etc.

Task 5. Develop Technical Documentation for SHEDS-HT

The Contractor will develop and or revise a Technical Manual for SHEDS-HT, similar in content scope and format to technical manuals previously developed for the SHEDS-Multimedia Residential and Dietary models. This technical manual will describe all input files (including development of default data), model algorithms, model QA routines, and output files.

QA/QC Requirements for WA:

The Contractor will develop an updated QAPP for SHEDS-HT under Task 2. The QAPP will be developed based on the review criteria for category 4 modeling QAPPs in the NERL Quality Management Plan (Exhibit 7.5.2, pg. 79) as well as the EPA Guidance for QAPPs for Modeling (EPA QA/G-5M) that can be found here, http://www.epa.gov/quality/qs-docs/g5m-final.pdf. The QAPP will identify responsibilities of both EPA and the Contractor, and lay out quality objectives and criteria. Note that the Contractor may begin work on Task 1 (Work Plan development) prior to delivery of the QAPP. The Contractor will adhere to the QAPP when completing Tasks 3-5.

Deliverables:

A meeting shall be arranged and conducted by the Contractor to discuss the initiation of the tasks with the WACOR. Subsequently, phone conferences or meetings shall be conducted by the Contractor on a bi-weekly basis to discuss with the WACOR the progress and any issues associated with the tasks. The Contractor shall adhere to the following schedule:

Task	Deliverable	Delivery Schedule
3	Distributable SHEDS-HT R package	December 31, 2015
4	Updated draft SHEDS-HT documentation	December 31, 2015
5	Final SHEDS-HT R package and documentation incorporating all code changes performed under this WA	March 31, 2015

Reporting Requirements:

The Contractor shall provide monthly progress reports in accordance with the terms of the contract. In addition, the Contractor shall deliver to the WACOR any draft and final reports in electronic format that is readable by windows-based word-processing (Microsoft Word 2003), graphics (Microsoft PowerPoint 2003), spreadsheet (Excel 2003), and database (MySQL) programs.

Work Assignment Contracting Officer's Representative (WACOR):
WACOR: Kristin Isaacs
Phone: (919) 541-2785

Alternate WACOR Name: Peter Egeghy
Phone: (919) 541- 4103

U.S. Environmental Protection Agency
Office: ORS/NERL
Division (Mail Code): HEASD (E205-02)
109 TW Alexander Drive
Research Triangle Park, NC 27711
Phone: (919) 541-2785

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-78

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-14-001	11/01/2013 To 10/31/2016 Base Option Period Number 2	SHEDS-HT Model Software

Contractor	Specify Section and paragraph of Contract SOW
ICF INCORPORATED, L.L.C.	B - Risk Assessment Methods Research and Developme

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [X] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 11/05/2015 To 10/31/2016

Comments:
Approval NTE $55,500

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

SFO (Max 2): ☐

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code
1										
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Authorized Work Assignment Ceiling

	Cost/Fee	LOE
Contract Period: 11/01/2013 To 10/31/2016	$0.00	0
This Action:	$64,019.00	740
Total:	$64,019.00	740

Work Plan / Cost Estimate Approvals

Contractor WP Dated: 11/25/2015	Cost/Fee	$64,019.00	LOE: 740
Cumulative Approved:	Cost/Fee	$64,019.00	LOE: 740

Work Assignment Manager Name: Kristin Isaacs (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	919-541-2785
	FAX Number:	
Project Officer Name: Melissa Revely-Wilson (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	919-541-0207
	FAX Number:	
Other Agency Official Name (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	
	FAX Number:	
Contracting Official Name: William Gosden (Signature) 2/09/2016 (Date)	Branch/Mail Code:	
	Phone Number:	513-487-2852
	FAX Number:	513-487-2107

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-78

☐ Other ☒ Amendment Number: 000001

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-14-001	11/01/2013 To 10/31/2016 Base Option Period Number 2	SHEDS-HT

Contractor: ICF INCORPORATED, L.L.C.

Specify Section and paragraph of Contract SOW:

Purpose:
- ☐ Work Assignment
- ☒ Work Assignment Amendment
- ☐ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 11/05/2015 To 10/31/2016

Comments:
This amendment will incrementally increase the hours (number)/cost(number)

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

SFO (*Max 2*): ☐

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code
1										
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Authorized Work Assignment Ceiling

	Cost/Fee:	LOE:
Contract Period: 11/01/2013 To 10/31/2016		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Kristin Isaacs (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 919-541-2785	
	FAX Number:	
Project Officer Name: Melissa Revely-Wilson (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 919-541-0207	
	FAX Number:	
Other Agency Official Name (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	
	FAX Number:	
Contracting Official Name: William Yates (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 513-487-2055	
	FAX Number:	

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-78

☐ Other ☒ Amendment Number: 000001

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-14-001	11/01/2013 To 10/31/2017 Base X Option Period Number	

Contractor: ICF INCORPORATED, L.L.C.

Specify Section and paragraph of Contract SOW:

Purpose:
- ☐ Work Assignment
- ☒ Work Assignment Amendment
- ☒ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 11/05/2015 To 10/31/2016

Comments:

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

SFO (*Max 2*): ☐

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code
1										
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Authorized Work Assignment Ceiling

	Cost/Fee	LOE
Contract Period: 11/01/2013 To 10/31/2017	$0.00	0
This Action:	$0.00	0
Total:	$0.00	0

Work Plan / Cost Estimate Approvals

	Cost/Fee	LOE
Contractor WP Dated: 09/19/2016	$0.00	0
Cumulative Approved:	$0.00	0

Work Assignment Manager Name: Kristin Isaacs (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-2785 FAX Number:
Project Officer Name: Melissa Revely-Wilson (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-0207 FAX Number:
Other Agency Official Name: (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: William Yates (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2055 FAX Number:

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-79

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-14-001	11/01/2013 To 10/31/2016	Data for the Toxicity Pathways
	Base Option Period Number 2	

Contractor: ICF INCORPORATED, L.L.C.

Specify Section and paragraph of Contract SOW: A. 1, B. D. E. G

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 11/01/2015 To 10/31/2016

Comments:
A. Assessment Issues and Documents
1. Human Health Assessment Documents
B. Risk Assessment Data Bases and Computer Tools exposure assessment

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (*Max 2*) ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
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Authorized Work Assignment Ceiling

Contract Period: 11/01/2013 To 10/31/2016 — Cost/Fee: — LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: — Cost/Fee: — LOE:

Cumulative Approved: — Cost/Fee: — LOE:

Work Assignment Manager Name: Catherine Gibbons (Signature) (Date)	Branch/Mail Code: Phone Number: 703-603-0704 FAX Number:
Project Officer Name: Melissa Revely-Wilson (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8523 FAX Number: 703-347-8696
Other Agency Official Name: (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Adam Meier (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2852 FAX Number: 513-487-2107

PERFORMANCE WORK STATEMENT
CONTRACT NO. EP-C-14-001
WA 2-79

TITLE: Support for the Analysis, Evaluation, and Synthesis of Mechanistic Data for the Toxicity Pathways Workgroup (TPWG)

Specify Section & Paragraph SOW:

A. Assessment Issues and Documents
1. Human Health Assessment Documents
B. Risk Assessment Data Bases and Computer Tools exposure assessment
D. Analysis, Document and Issue Paper Preparation
E. Risk Assessment Support
G. Literature Search

PERIOD OF PERFORMANCE: *11/1/15 to 10/31/16*

I. PURPOSE

The purpose of this Work Assignment is to provide services to the U.S. Environmental Protection Agency's (hereinafter EPA or Agency) National Center for Environmental Assessment (NCEA), Office of Research and Development (ORD), related to the analysis, evaluation, and synthesis of mechanistic data to support carcinogenic and noncancer mode of action evaluations in IRIS Toxicological Assessments. Specifically, support may include focused literature searches and support for the HERO database, continued development of the cellDRAGON database and user interface, and optional support for further evaluation and synthesis of mechanistic evidence, primarily for the preparation of toxicological reviews by NCEA's IRIS Program.

II. BACKGROUND

EPA's IRIS Program is an assessment program that evaluates qualitative and quantitative information on human health effects that may result from exposure to chemicals found in the environment. Through the IRIS Program, EPA provides science-based human health assessments to support the Agency's activities. The IRIS database contains hazard characterization and toxicity values for the first two steps of the risk assessment process—hazard identification and dose-response assessment. By combining IRIS toxicity values with information on chemical exposure, government and other entities can characterize health risks of chemicals.

EPA's process for developing IRIS assessments consists of: (1) draft development, which includes a public meeting focused on identifying the available scientific information; a comprehensive search of the scientific literature; release of preliminary materials (literature search and associated search strategies, evidence tables, and exposure-response figures); and a public meeting to discuss the early materials; (2) EPA-wide internal review; (3) science consultation on the draft assessment with other Federal agencies and the Executive Office of the President; (4) public review and comment, including a public meeting to discuss the draft assessment and draft peer review charge, and independent expert peer review; (5) revision of the assessment to address peer review and public comments; (6) a second EPA-wide internal review and interagency discussion with other Federal agencies and the Executive Office of the President; and (7) posting of the final assessment to the IRIS website (www.epa.gov/iris/).

The Toxicity Pathways Workgroup (TPWG) is tasked with reviewing and evaluating mechanistic studies for all IRIS toxicological reviews, for both cancer and noncancer health outcomes, and for synthesizing this evidence and evaluating hypothesized modes of action for identified potential human health hazards.

Under a previous contract, software utilities (DRAGON and BMDS-WIZARD) were developed for IRIS. These tools are based on Microsoft Access, MS/Excel, some VBA code, and BMDS software. The purpose of these tools is to expedite the entry and QA of information and data from toxicological studies, to expedite the production of tables for IRIS chemical assessments, and to expedite the conduct of dose-response analysis and related calculations and the review and reporting of results. These tools have greatly increased throughout and decreased effort for assembling and reporting information for IRIS assessments. CellDRAGON is being adapted from DRAGON to capture study details on methods and results from mechanistic studies and facilitate analyses of these data.

This PWS addresses the following step of the IRIS process for assessment development: Step 1—development of the draft Toxicological Review (http://www.epa.gov/iris/process.htm). In this process, the Contractor shall follow applicable EPA guidance (see http://www.epa.gov/iris/backgrd.html).

III. STATEMENT OF WORK

Task 1: Establish Communication

Within 3 days of start date of this WA, the Contractor shall schedule a conference call (not to exceed 1 hour) with the WAM and appropriate contractor staff to clarify outstanding questions and confirm the schedule and specific tasks.

Task 2: Work Plan, Staffing Plan, and Quality Assurance Project Plan (QAPP)

The Contractor shall prepare a Technical Work Plan describing how the work outlined in this Performance Work Statement will be performed, including deliverables, a schedule, budget, and level of effort. The Contractor shall also prepare a Staffing Plan, which shall be submitted as part of the Work Plan, that shows assigned personnel by task and the qualifications of the proposed personnel. The Contractor shall provide expertise in the areas of toxicology, pharmacology, physiology, chemistry, statistics, and library science. A working knowledge of risk assessment methodology and EPA risk assessment guidelines is required.

The Contractor shall develop a QAPP for approval by the WAM and Quality Assurance Manager. The Contractor must address in the QAPP how they are going to consider the use of secondary data to carry out this task. Secondary data are defined as environmental or health data that were developed for a different purpose. This includes data used from citations found in the literature. See these documents: "*EPA Manual C/0 2105-P-01-0: EPA Quality Manual for Environmental Programs* (QAPP)"; "*EPA Requirements for Quality Assurance Project Plans (QA/R-5)*"; "Appendix A. *Guidance on Quality Assurance Project Plans for Secondary Research Data*"; "*EPA 100/B-03/001: A Summary of General Assessment Factors for Evaluating the Quality of Scientific and Technical Information* (2003)," and the addendum, "*Guidance for Evaluating and Documenting the Quality of Existing Scientific and Technical Information* (2012)."

The QAPP shall be submitted simultaneously with the Work Plan for approval.

Task 3: Maintenance of the HERO Database for Mechanistic Literature

The Contractor shall perform the following to ensure the HERO database is up to date for mechanistic studies identified in literature searches for chemicals being reviewed and evaluated by the TPWG:

- Following initial literature search and tagging, ensure that the full-text copy (i.e. PDFs) of all literature tagged as "mechanistic" are available through HERO. This may be performed initially by working with HERO staff to implement a batch full-text download for the entire database of tagged mechanistic studies.

- Ensure that literature listed in HERO for a particular search are appropriately tagged to the correct chemical project and bin.

Ensure that PDFs of references not previously identified in original literature search (i.e., retrieved during draft development, literature search update and/or referenced in the IRIS document) are uploaded to HERO and tagged appropriately.

Task 4. DRAGON (Dose Response Analytical Generator and Organizational Network)

This Task covers additions to and modifications of cellDRAGON only, except where it may be necessary to integrate this module into a single database system. EPA expects to request additions of new data fields and simple calculations in cellDRAGON, to support reporting needs for evidence tables. For the purpose of costing this PWS, the contractor should assume that a dozen such changes may be requested by EPA. Changes or additions to data fields for developmental studies can be expected. Export and import capabilities (e.g. for data exchange with Meta-data Viewer, Graphpad, and MS Excel, as well as importing into document formatting software, currently MS Word) may be requested. Forms, or export capabilities, or reporting formats compatible with HERO may be requested.

Additions of data fields and capabilities may include specialized fields for relevant health effects, study designs, and assays measuring endpoints that fall into designated mechanistic categories (e.g., micronucleus assay, which measures chromosomal aberrations and aneuploidy, under the "genotoxic" category, etc.). Modifications to cellDRAGON are expected to be iterative, with periodic evaluation performed using 'test' or 'practice' sets of data/studies. The contractor will verify correct operation of cellDRAGON during development and after completion of a beta version, and will report periodically to the WAM on results of testing and on measures to correct any problems found by testing or in use. This work assignment will continue and extend development of cellDRAGON but shall not duplicate work already done for the federal government. [For example, modifications to cellDRAGON made under another work assignment would not be repeated under this work assignment.]

Deliverables and due dates:
Requests for new and revised fields and forms will be specified in written technical direction
Drafts of cellDRAGON for review - arranged by consultation with WAM
Reports on testing with 'practice data' – approx. every 4 weeks or as directed by WAM during development
Word report/table templates – to be requested in written technical directions

Task 5. User Manuals and Tutorials

User manuals will be developed for cellDRAGON (these will also cover use of the imbedded dosimetry tool). Scope: the manuals will provide users with instructions sufficient for end-use, but are not expected to explain the workings of Access or Excel or the details of the associated VBA code. Manuals will be provided with databases that may be used in the manuals as examples and can be used by users as templates. Necessary information will be provided separately on any modifications (including VBA code) and configuration steps needed to use these databases on a proxy server. Manuals will be revised within one month of any significant changes to cellDRAGON.

Tutorials will be provided (dates to be determined in consultation with EPA). These may take the form of demonstration/lectures, either on-site at EPA locations or as webinars. Provision will be made for user questions and answers. For the purpose of costing this PWS, the contractor should assume that EPA would request eight demonstration/lectures, four at each of two EPA locations. Some might be conducted via webinar, but others might be in-person at different EPA locations.

The manuals and tutorials may have already been drafted/planned under another work assignment; this work assignment shall not duplicate work already done for the federal government.

Deliverables and due dates:
Manuals: draft within 15 working days of consultation with WAM regarding this task; revised drafts within 10 working days after EPA returns comments
Tutorials: dates to be arranged in consultation with EPA

Task 6. User Group Meetings

Meetings will be arranged as telephone conferences and/or web conferences. The contractor shall coordinate and organize meetings, distribute agendas, and report minutes and action items.

Meeting frequency will be determined by consultation with EPA; expected frequency is monthly to bi-monthly, but ad-hoc meetings may be called (as needed) to discuss new modules and new or changed features. Details of attendees and subject matter will be arranged in consultation with EPA. The principal purposes are (a) to gather input from users in the TPWG regarding cellDRAGON features and usability (existing or planned) and (b) to share information about and reconcile needs of different users both within EPA (including HERO users and staff) and in other federal agencies.

This work assignment will continue and extend development of cellDRAGON but shall not duplicate work already done for the federal government.

Deadlines: meeting dates and times to be determined in consultation with EPA and other users

OPTIONAL TASKS

The following tasks are optional. If EPA determines the services under these tasks are required, the EPA WAM will initiate by issuing written technical direction. These optional tasks should be addressed in the technical proposal and included in the cost proposal of the work plan.

Optional Task 7: Preparation and Quality Assurance of Mechanistic Evidence Tables

Optional Task 7a: Preparation of Evidence Tables for Mechanistic Studies

The Contractor may be directed to provide support to EPA in preparing evidence tables and simple graphics that summarize genetic toxicity and/or other mechanistic studies. There are two phases of tables and/or graphics that may be generated:

1) Preliminary categorization of mechanistic studies: In the early stages of the assessment, following identification of mechanistic literature, basic mechanistic study information will be extracted into either cellDRAGON or into MS Access or Excel spreadsheets for assessments prior to optimization of cellDRAGON. Basic graphics representing the overall findings will accompany these tables. Further details of examples of tables containing the information requested will be provided to the Contractor by the WAM.

2) Selected mechanistic evidence tables: During the synthesis phase of draft development, mechanistic evidence tables will be developed that emphasize crucial aspects of the data. These may include tables generated from data entered into cellDRAGON. If these studies are not already in cellDRAGON, the WAM will provide the Contractor with an endnote file or Excel spreadsheet containing these studies and any existing work on selecting and organizing the studies. Examples of tables containing the information requested will also be provided to the Contractor by the WAM.

Optional Task 7b: Update and Quality Assurance of Mechanistic Evidence Tables

The Contractor may be directed to provide support to the TPWG in performing updates and quality assurance checks of tables that summarize mechanistic studies and data. Updates of these tables shall be performed to add new studies identified through literature search updates performed during development of the draft assessment or during review steps. Quality assurance checks shall include the following: comparison of table entries to information from the original publication, checking conversions as appropriate (e.g., ppm to mg/m^3), confirming

effect levels, and inserting and verifying HERO links. For each health effect category, separate evidence tables will be developed (if data are available), and all routes of exposure will be considered in the absence of more specific technical direction. The quality assurance check should be performed by a scientist that was not involved in the initial development of the table being reviewed. These tables will be provided to the Contractor by the WAM.

Optional Task 8: Update Literature Search Specific to Mechanistic Studies Database

If the TPWG determines that a new literature search must be conducted that is more specific to a mechanism of carcinogenicity identified in the original literature search, the Contractor shall perform this literature search and/or update at the direction of the WAM. The literature search strategy shall be consistent with the strategy for other literature searches conducted by ICF and with the latest draft of the Handbook for IRIS Assessment Development. The Contractor shall add new references to HERO, tag references consistent with existing tags in HERO, and document the updated literature search strategy and findings.

If questions arise during the literature search and screening task (e.g., difficulties in narrowing down the number of "hits" from the search, questions about the relevance of certain types of papers or topics, retrieval of difficult to obtain documents or foreign language papers), the Contractor shall contact the WAM for further guidance.

Optional Task 9: Synthesis of Mechanistic Evidence for Mode of Action Evaluation

The TPWG may require support from the Contractor for synthesizing the mechanistic information that has been organized into tables. This task may vary in complexity depending on the specific request for a chemical assessment. For example, the following syntheses may be requested:

- A concise, higher-level overview of mechanistic events theorized to be operant and/or hypothesized modes of action (MOAs) based on the data available (i.e., a short, 2-4 page summary), including some indication of what highly informative data may be missing (a "summary" as described in the IRIS Handbook, Chapter 6.3.2)
- An evaluation of mechanistic evidence, assembling it into groups or nodes corresponding to hypothesized mechanistic events or "key events," with suggestions of more specific MOAs and/or adverse outcome pathways or networks (AOPs or AONs) that will be further analyzed by the TPWG (IRIS Handbook Chapter 6.3.2)
- A highly detailed evaluation of mechanistic evidence, including construction and analysis of hypothesized MOAs and/or AOPs/AONs, and the weight of evidentiary support for each (IRIS Handbook Chapter 6.3.3)
- General consultation, including comments, suggestions, or constructive feedback upon review of TPWG-generated materials falling into the above categories

The Contractor shall contact the WAM for specific guidance or instructions.

Optional Task 10: Identify, Recruit, and Manage Scientists with Expertise in the Mechanisms of Carcinogenesis

The Contractor may be directed to identify, recruit, and manage experts in the mechanisms and pathways of chemical carcinogenesis ("experts") to develop or review sections of IRIS Toxicological Reviews and/or related materials. The Contractor shall be responsible for ensuring timely communication is passed between the EPA work assignment manager (WAM) and the experts so that technical clarification can be offered and interaction between EPA and the experts can occur as needed. The Contractor shall also ensure that the deliverables are provided to the EPA WAM in a timely manner.

EPA will provide direction and examples and/or templates for the specific work requested from the expert, which could include: consultation and participation in topical TPWG discussions; study methods evaluation; evidence identification, evaluation, and synthesis of mechanistic evidence and hypothesized MOAs and/or AOPs; or guidance

on the development of evidence and summary tables, or MOA/AOPs developed by the TPWG. The chemical assessments and related documents that will require assistance under this PWS will be clarified through technical direction.

The EPA assumes primary authorship in the writing process for all materials and contributing experts are listed in the final documents as appropriate. EPA will approve each of the experts performing work within two days of notification of a potential candidate.

1) Identify and Recruit Cancer Experts: The Contractor shall identify and contact experts with a knowledge base that is aligned with the descriptions in each written technical directive (TD). Each TD will specify the minimum/desired qualifications of the experts for that chemical assessment. The expertise needed will be specific within the broad field of carcinogenesis. Potential experts shall be asked to submit a bio-sketch to ensure they meet the minimum/desired qualifications, and EPA will notify the contractor of its concurrence with the selection.

2) Manage Cancer Experts: The Contractor shall manage the recruited experts and ensure timely communication occurs between EPA and the experts. This shall involve setting up conference calls with the experts and EPA staff. In addition, the Contractor shall ensure that the written sections, comments and draft reviews are progressing on schedule and are delivered by the deadlines noted in this WA.

Deliverable Schedule: The schedule and specific expertise requested will be clarified within a TD.

Commented [FJ1]: Do we need to include a note regarding control of COI? As in, the contractor will attempt to identify and avoid or minimize all potential COIs?

IV. ANTICIPATED DELIVERABLES

All products by the Contractor must be of high quality, written in a clear concise style, with a logical organization and presentation.

V. DELIVERABLES AND SCHEDULE

Task	Deliverable Due Date
Task 1. Initial Conference Call	3 days after award of Work Assignment
Task 2. Staffing Plan and QAPP	15 days after award
Task 3: Maintenance of HERO Database	No more than 30 days after discussion with WAM.
Task 4: cellDRAGON	Drafts of cellDRAGON for review: arranged by consultation with WAM
	Oral reports on testing with practice data or in use for EPA projects – approx. every 4 weeks during development
	Beta versions of cellDRAGON after adding new modules - arranged by consultation with WAM
	Revisions in response to EPA comments - 14 work days after receiving technical direction
Task 5: User Manuals and Tutorials	Manuals: draft within 15 working days of consultation with WAM regarding this task; revised drafts within 10 working days after EPA returns comments
	Tutorials: dates to be arranged in consultation with EPA
Task 6: User Group Meetings	To be determined in consultation with EPA and other users
Optional Task 7a: Preparation of Evidence Tables for Mechanistic Studies	No more than 45 days after discussion with WAM

Task	Deliverable Due Date
Optional Task 7b: Update and Quality Assurance of Mechanistic Evidence Tables	No more than 20 days after discussion with WAM
Optional Task 8: Updates to Literature Search Specific to Mechanistic Studies Database	For each update, no more than 30 days after initiation of literature search
Optional Task 9: Synthesis of Mechanistic Evidence for Carcinogenesis	45 days after discussion with the WAM
Optional Task 10: Identify, Recruit, and Manage Scientists with Expertise in the Mechanisms of Carcinogenesis	To be determined based on scope of work outlined in TD

Note: All days are calendar days.

VI. MANAGEMENT CONTROLS

1. All deliverables shall be reviewed for conformance to the requirements of this work assignment before being approved as final.

2. The contractor shall comply with other applicable requirements for final work assignment reports stipulated in contract.

VII. NOTICE REGARDING GUIDANCE PROVIDED UNDER THIS PROJECT

Guidance is strictly limited to technical and analytical support. The contractor shall not engage in activities of an inherent governmental nature such as the following:

(1) Formulation of Agency policy
(2) Selection of Agency priorities
(3) Development of Agency regulations

Should the contractor receive any instruction from an EPA staff person that the contractor ascertains to fall into any of these categories or goes beyond the scope of the contract or work assignment, the contractor shall immediately contact the PO, WAM, or CO.

VIII. SPECIAL CONDITIONS AND ASSUMPTIONS

The contractor shall hold a conference call with the EPA WAM at the initiation of the work assignment, and shall provide a bi-weekly update to the WAM by telephone for the duration of the work assignment, in addition to the standard reporting requirements of the contract.

IX. EPA CONTACT INFORMATION

Copies of all correspondence pertaining to the performance of this work assignment shall be sent to the PO.

Work Assignment Manager (WAM):

Catherine F. Gibbons, PhD
Telephone: 703-603-0704
Fax: 703-347-8689
e-mail: gibbons.catherine@epa.gov

Mailing Address:

U.S. Environmental Protection Agency
Office of Research and Development
National Center for Environmental Assessment (MC 8601P)
1200 Pennsylvania Ave. NW
Washington, DC 20460

Overnight Delivery location:
U.S. Environmental Protection Agency
Office of Research and Development
National Center for Environmental Assessment
Two Potomac Yard (N-7215)
2733 S. Crystal Drive
Arlington, VA 22202

Alternate WAM:

Jason Fritz
Telephone: 703-347-0332
Fax: 703-347-8689
e-mail: fritz.jason@epa.gov

Mailing Address:
U.S. Environmental Protection Agency
Office of Research and Development
National Center for Environmental Assessment (MC 8601P)
1200 Pennsylvania Ave. NW
Washington, DC 20460

Overnight Delivery location:
U.S. Environmental Protection Agency
Office of Research and Development
National Center for Environmental Assessment
Two Potomac Yard
2733 S. Crystal Drive
Arlington, VA 22202

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-79

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-14-001	11/01/2013 To 10/31/2016 Base Option Period Number 2	Toxicity Pathways Workgroup

Contractor	Specify Section and paragraph of Contract SOW
ICF INCORPORATED, L.L.C.	See comments

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [X] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 11/01/2015 To 10/31/2016

Comments:
A. Assessment Issues and Documents
1. Human Health Assessment Documents
B. Risk Assessment Data Bases and Computer Tools exposure assessment

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (*Max 2*) ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Cost/Fee	LOE
Contract Period: 11/01/2013 To 10/31/2016	$0.00	0
This Action:	$127,998.00	1,056
Total:	$127,998.00	1,056

Work Plan / Cost Estimate Approvals

	Cost/Fee	LOE
Contractor WP Dated: 12/14/2015	$127,998.00	1,056
Cumulative Approved:	$127,998.00	1,056

Work Assignment Manager Name: Catherine Gibbons (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	703-603-0704
	FAX Number:	
Project Officer Name: Melissa Revely-Wilson (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	919-541-0207
	FAX Number:	
Other Agency Official Name (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	
	FAX Number:	
Contracting Official Name: Adam Meier (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	513-487-2852
	FAX Number:	513-487-2107

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-80

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-14-001	11/01/2013 To 10/31/2016	Fish-habitat modeling
	Base Option Period Number 2	

Contractor: ICF INCORPORATED, L.L.C.

Specify Section and paragraph of Contract SOW: C. Risk Assessment Data Bases and Computer Tools:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 11/01/2015 To 10/31/2016

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

SFO (*Max 2*): ☐

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Contract Period:	Cost/Fee:	LOE:
	11/01/2013 To 10/31/2016		
This Action:			
Total:			

Work Plan / Cost Estimate Approvals

Contractor WP Dated:		Cost/Fee:	LOE:
Cumulative Approved:		Cost/Fee:	LOE:

Work Assignment Manager Name: Bob Mckane (Signature) (Date)	Branch/Mail Code: Phone Number: 541-754-4631 FAX Number:
Project Officer Name: Melissa Revely-Wilson (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8523 FAX Number: 703-347-8696
Other Agency Official Name: (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Adam Meier (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2852 FAX Number: 513-487-2107

PERFORMANCE WORK STATEMENT
CONTRACT NO. EP-C-14-001
WA 2-80

TITLE: Fish-habitat modeling for Puget Sound Rivers

Specify Section & Paragraph SOW: Please select from the following:

C. Risk Assessment Data Bases and Computer Tools: 1. Technical Support, and 2. Develop/refine Exposure Tools

PERIOD OF PERFORMANCE: 11/1/15 – 10/31/16

I. PURPOSE

The objectives of the work described in this PWS are to:

1. Develop approaches for converting VELMA outputs for reach-level streamflow, stream temperature, large woody detritus and sediment into stream habitat attributes that can be used by fish population models such as Ecosystem Diagnosis and Treatment (EDT)
2. Incorporate VELMA outputs into EDT model runs to assess changes in fish habitat conditions within the basin under alternate scenarios
3. Provide training for EPA scientists in the parameterization and application of EDT for assessing effects of climate and land management on stream habitat and fish populations

II. BACKGROUND

EPA is evaluating effects of water quality, quantity, and habitat changes on fishery resources associated with land management (including restoration activities) and climate change. Efforts are underway to link ecohydrologic models with fish population models for evaluation of future scenarios that may include changes in vegetation, climate, streamflow, water temperature, and channel morphology. EPA is applying an ecohydrologic model (VELMA) to the Mashel and Nisqually river watersheds to evaluate such scenarios. Assistance is needed to link VELMA outputs to fish population models.

III. STATEMENT OF WORK

Task 1: Establish Communication

Within 3 days of start date of this WA, the Contractor shall schedule a conference call (not to exceed 1 hour), with the Work Assignment Contract Officer Representative (WA-COR) and appropriate contractor staff to clarify outstanding questions and confirm the schedule and specific tasks.

Task 2: Work Plan, Staffing Plan, Call Schedule, and Quality Assurance Project Plan (QAPP)

The Contractor shall prepare a Technical Work Plan describing how the work outlined in this Performance Work Statement will be performed, including deliverables, a schedule (including regular calls), budget, and level of effort. The Contractor shall also prepare a Staffing Plan, which shall be submitted as part of the Work

Plan that shows assigned personnel by task and the qualifications of the proposed personnel. The Contractor shall provide expertise in the basic science areas required to complete this WA.

The Contractor shall develop a QAPP for approval by the WA-COR and Quality Assurance Manager. The QAPP shall be submitted simultaneously with the Work Plan for approval, 15 days after award. The Contractor shall not perform any work on subsequent tasks under this WA until the Work Plan and QAPP are reviewed and approved.

Task 3. Linking VELMA to stream reach network habitat characteristics

1. Identify the needs of EDT for stream habitat attributes of streamflow and temperature.
2. Develop methods to convert VELMA outputs to appropriate stream attributes
    a. Summarize VELMA outputs (reach-level streamflow, stream temperature, large woody detritus and sediment) to spatial and temporal resolutions appropriate for EDT application
    b. Utilize VELMA outputs to parameterize stream temperature models, which may include process-based temperature models or spatial statistical models; summarize temperature model output to spatial and temporal resolutions appropriate for EDT application

Task 4. Application of Ecosystem Diagnosis and Treatment (EDT) model to Mashel-Nisqually River System

1. Apply EDT to the Mashel-Nisqually River System to identify changes in fish habitat conditions associated with climate and land management scenarios provided by VELMA. These may include:
    a. High, middle and low GCM projections for temperature and precip during the next 200 years.
    b. Alternative forest management scenarios including short (40 yr) versus long (e.g., 80 yr, 160 yr) harvest intervals.
    c. Alternative riparian buffer width restrictions.
    d. In-stream habitat restoration practices such as constructed log jams, channel restoration, etc.

Task 5. Final Report Including Delivery of the Fully Parameterized EDT Application for the Mashel-Nisqually River System

1. Provide the Fully Parameterized EDT Software Application for the Mashel-Nisqually River System for simulating the effects of land management and climate scenarios specified in Tasks 3 and 4.
2. Provide technical training in the parameterization and application of EDT to a degree that is sufficient for professional-level fish biologists/modelers to successfully repeat simulations described in Tasks 3 and 4.
3. Provide final report summarizing findings for Tasks 3-4, including QA/QC results for EDT parameterization and predicted responses of specified fish species to alternative climate and land management scenarios for the Mashel/Nisqually system during the next 200 years.

IV. ANTICIPATED DELIVERABLES

All products by the Contractor must be of high quality, written in a clear concise style, with a logical organization and presentation. Deliverables shall be provided to EPA in electronic formats compatible with EPA-supported software (e.g., Excel spreadsheets, Word documents, BMDS accessory files [*.(d), *.out, *opt, *.ssn]).

V. DELIVERABLES AND SCHEDULE

Task 1. Initial Conference Call	3 days after award of Work Assignment
Task 2. QAPP Call schedule	15 days after award Regular calls throughout WA
Task 3. Linking VELMA to stream reach network habitat characteristics	30 weeks after award and WA approval
Task 4. Application of Ecosystem Diagnosis and Treatment (EDT) model	36 weeks after award and WA approval
Task 5. Final Report Including Delivery of the Fully Parameterized EDT Application and Technical Training for EPA in the Parameterization and Application of EDT	Final EDT application, technical training, and draft analytical report due 8 weeks after completing Task 4 (week 44) Final report due 8 weeks after receiving comments from WA-COR (week 52)

Note: All days are calendar days.

VI. MANAGEMENT CONTROLS

1. All deliverables shall be reviewed for conformance to the requirements of this work assignment before being approved as final.

2. The contractor shall comply with other applicable requirements for final work assignment reports stipulated in contract.

VII. NOTICE REGARDING GUIDANCE PROVIDED UNDER THIS PROJECT

Guidance is strictly limited to technical and analytical support. The contractor shall not engage in activities of an inherent governmental nature such as the following:

(1) Formulation of Agency policy
(2) Selection of Agency priorities
(3) Development of Agency regulations

Should the contractor receive any instruction from an EPA staff person that the contractor ascertains to fall into any of these categories or goes beyond the scope of the contract or work assignment, the contractor shall immediately contact the PO, WA-COR or CO.

VIII. SPECIAL CONDITIONS AND ASSUMPTIONS

The contractor shall hold a conference call with the EPA WA-COR at the initiation of the work assignment, and shall provide a bi-weekly update to the WA-COR by telephone for the duration of the work assignment, in addition to the standard reporting requirements of the contract.

IX. EPA CONTACT INFORMATION

Copies of all correspondence pertaining to the performance of this work assignment shall be sent to the PO.

Contract Officer Representative and Alternate Contract Officer Representative for Tasks Described Herein for "Fish-habitat modeling for Puget Sound Rivers":

Work Assignment Contract Officer Representative (WA-COR)	**Alternate Work Assignment Contract Officer Representative (Alt WA-COR)**
Name: Bob McKane	Name: Joe Ebersole
Office: ORD/NHEERL/WED	Office: ORD/NHEERL/WED
Phone: 541-754-4631	Phone: 541-754-4775
Fax: 541-754-4799	Fax: 541-754-4799
Email: mckane.bob@epa.gov	Email: ebersole.joe@epa.gov

Appendix A

Responder Requirements Demonstrating Their Organization's Quality Assurance and Quality Control System

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by each responder. Providing responses to the list of topics provided below are sufficient to demonstrate this conformance. Responding to the topics listed below provides a description of each responder's Quality System that sets forth its capabilities in providing products (such as those described in the Statement of Work) of known and verifiable quality. Each responder, as a separate and identifiable part of its technical proposal, shall submit its responses to these topics. The Quality System documentation of the responders will become part of the evaluation. For more information on these requirements visit: http://www2.epa.gov/quality/epa-qar-5-epa-requirements-quality-assurance-project-plans

For the successful responder, the Quality System documentation will be reviewed by the EPA Quality Assurance Manager and approved following an acceptable response to his requested revisions. In addition, a project-specific Quality Assurance Project Plan (QAPP) (following directions in WED's Quality Management Plan) shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the successful responder shall also implement it as written and approved by the Government.

Topics to be addressed in demonstrating your organization's Quality Assurance and Quality Control System

(a) A statement of policy concerning the organization's commitment to implement a Quality Control/Quality Assurance program to assure generation of data of adequate quality to meet the requirements of the Statement of Work.

(b) An organizational chart showing the position of a QA function or person within the organization. It is highly desirable that the QA function or person be independent of the functional groups which generate measurement data.

(c) A delineation of the authority and responsibilities of the QA function or person.

(d) The type and degree of experience in developing and applying Quality Control/Quality Assurance procedures to the proposed methods needed for performance of the Statement of Work.

(e) The background and experience of the proposed personnel who will be assigned to the project.

(f) The responder's general approach for accomplishing the QA specifications within the scope of the Statement of Work or their specific approach that would provide results of known and verifiable quality.

The responders shall be aware of the following nonexclusive list of words and phrases that may indicate the need for a discussion of QA activities as they describe the various (a thru f) features of the particular application of their institution's Quality System to this Statement of Work.

validation
verification
hardware/software evaluation
audit procedures
system evaluation
configuration management
change control
acceptance or QA/QC testing
Standard Operating Procedures
documenting software code

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-80

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-14-001	11/01/2013 To 10/31/2016 Base Option Period Number 2	Fish-habitat modeling

Contractor: ICF INCORPORATED, L.L.C.

Specify Section and paragraph of Contract SOW: See Comments

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [X] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 11/01/2015 To 10/31/2016

Comments:
C. Risk Assessment Data Bases and Computer Tools: 1. Technical Support, and 2. Develop/refine Exposure Tools

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Cost/Fee	LOE
Contract Period: 11/01/2013 To 10/31/2016	$0.00	0
This Action:	$53,042.00	488
Total:	$53,042.00	488

Work Plan / Cost Estimate Approvals

	Cost/Fee	LOE
Contractor WP Dated: 11/20/2015	$53,042.00	488
Cumulative Approved:	$53,042.00	488

Work Assignment Manager Name: Bob Mckane	(Signature)	(Date)	Branch/Mail Code: Phone Number: 541-754-4631 FAX Number:
Project Officer Name: Melissa Revely-Wilson	(Signature)	(Date)	Branch/Mail Code: Phone Number: 919-541-0207 FAX Number:
Other Agency Official Name	(Signature)	(Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: William Yates	(Signature)	1/19/2016 (Date)	Branch/Mail Code: Phone Number: 513-487-2852 FAX Number: 513-487-2107